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STABLE MANAGEMENT
AND THE
PREVENTION OF DISEASE
AMONG
HORSES IN INDIA
—
MEYRICK





STABLE MANAGEMENT AND THE PREVENTION OF DISEASE

AMONG

HORSES IN INDIA.

BY

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THE PUNJAB.



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P R E F A C E.

THE following pages contain the substance of four lectures delivered during the present year at the Army Veterinary School in Aldershot, and are printed at special request. They were composed for the use of veterinary surgeons and other officers, who, although well acquainted with the management of horses in the British Islands, must necessarily be at a disadvantage when first placed in charge of them in a different country, where the food, methods of sheltering, and climate are very different from those at home.

Considerable numbers of horses in India are annually lost or rendered inefficient through causes which might be avoided; and the author, having served in that country twelve years, admits that, for some time after arriving there, his own want of local knowledge prevented him from adopting many precautions which subsequent experience showed to be advisable for preserving horses in the fullest health and vigour.

The Indian names, excepting those of places, are spelt according to the Hunterian system, in which

<i>a</i> is pronounced like <i>u</i> in <i>but</i>			
<i>ā</i>	”	”	<i>a</i> in <i>far</i>
<i>e</i>	”	”	<i>a</i> in <i>fate</i>
<i>i</i>	”	”	<i>e</i> in <i>the</i>
<i>o</i>	”	”	<i>o</i> in <i>mote</i>
<i>u</i>	”	”	<i>oo</i> in <i>boot</i>
<i>ai</i>	”	”	<i>ei</i> in <i>height</i>
<i>ao</i>	”	”	<i>ou</i> in <i>house</i>
<i>th</i>	”	”	<i>t</i> with a slight aspirate after it.

STABLE MANAGEMENT
AND THE
PREVENTION OF DISEASE
AMONG
HORSES IN INDIA.

BEFORE entering upon the subject of stable management in India, I will first make a few remarks about the best measures to be adopted for keeping horses in health where they are without any shelter whatever, and then go into details as to the construction of stables.

UNSTABLED HORSES.

The horses of the Bengal cavalry are usually, if not always, picketed in the open air, and, as some people contend, without any injurious effects. It is true that the exposure does not appear to cause actual disease in ordinary seasons, especially among Country-bred horses; but when the weather is very hot, Australians and Stud-breds suffer greatly, and fall off in condition. There is no doubt but that the Country-bred also is weakened considerably, for the Stud-bred is almost equal to him in power of enduring heat. I was stationed at Jhansie in 1878, when the hot season was unusually severe and protracted. The Artillery horses, consisting of Australians and Stud-breds, were in

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open lines, and were greatly distressed by the heat. One fell dead from pulmonary apoplexy. Nearly all of them became very thin, and the lives of several of the weakest were only saved by their being placed in the shoeing shed and under the verandas of the workshops and storehouses. After being thus sheltered for several days, there was always a marked improvement in them, and when they had partially recovered they were removed to make room for others. This system was continued until the end of the hot season ; but many months elapsed before the horses entirely recovered their strength and condition. I may mention that for some time before the rains commenced in that year, the temperature used to be 118° Fahrenheit in the shade every day late in the afternoon.

PROTECTION TO THE SPINE.

During exposure to a tropical sun, protection to the spine of both horse and man is of great importance. Among horses the best practicable method of affording this protection is to fold the blankets so as to make eight thicknesses of cloth and strap them in such a way as to cover the back from the shoulders to the hips.

Protection to the head also would be useful, and the horses of many private individuals in Calcutta and Bombay have sunshades fixed to the bridles when at work in harness.

PROTECTION FROM WIND AND RAIN.

Unstabled horses are liable to be chilled by either cold winds or by the torrents of rain that fall during the monsoon, and should always be protected by two blankets when it is actually raining. If these are of good material, the under blanket will be found almost dry, owing to the warmth of the skin causing the rapid evaporation of any water that trickles through the upper one.

During what are called breaks in the rains, which last from a few hours to a few days, although the temperature of the air in the shade is less than before the commencement of the monsoon, the rays of the sun feel hotter than ever, there

being nothing to impede their passage, owing to the air having been washed clear of all the particles of dust which floated in it during the dry season, and also owing to the condensation into rain of the watery vapour which had been suspended in it. The horses' backs then require to be as carefully protected as before, by placing folded blankets along their spines.

FLOORS OF UNCOVERED LINES.

The floors of the uncovered lines in which not only Bengal cavalry, but even horses of European corps are kept, are frequently very defective. They are, as is proper, raised above the level of the surrounding ground in order that rain-water may run off; but they are sometimes formed of porous earth, into which the urine sinks to a depth of two or three feet, giving off most noxious effluvia.

The best material for them would be good concrete; but as that is too expensive for the native troopers, who have to buy their own horses and make their own stable lines, at least in the Bengal Presidency, the only good floor usually practicable is one formed by digging out the soil to a depth of at least a foot, and filling in the hollow with clean tenacious clay, rammed as hard as possible, and added to until the surface is five or six inches higher than the surrounding ground. Upon this should be smeared a thin mortar-like mixture of clay and water to fill all the cracks or other interstices. Such a floor is almost impervious to urine, and during the greater part of the year it is hard and dry.

KANKAR FLOORS.

In those districts where the earth called kankar is found, the floor can be greatly improved by mixing a quantity of it with the clay, both being first broken into as fine pieces as possible before being rammed down. The best plan is to dry both kinds of earth, and, after powdering, pass them through coarse sieves. They can then be very intimately mixed, and if afterwards moistened and rammed, will form a floor far harder and more durable than one of clay alone.

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Before the last layer is rammed, a quantity of the kankar should be made into a thin mortar and spread over the surface so as to fill all crevices, as recommended above when speaking of clay floors. After it is rammed, some more should be smeared on to make it quite smooth.

COMPOSITION OF KANKAR.

Kankar, as found in the soil, is composed of nodules of chalk, in which a small quantity of clay is naturally mingled. The amount of clay may be guessed by the colour. When it is small, the kankar is almost white. When of this colour it should be mixed with clay in equal proportions to form the flooring. After a floor is formed, it should be left untouched for several weeks—five or six if possible. It will then solidify and harden, and will last much longer than if horses are picketed upon it at an earlier date.

SLOPE OF FLOORS.

A certain amount of slope is necessary in order that rain may run off freely; but three inches from front to rear in a floor twelve feet wide are quite sufficient. Floors are usually made with a much greater slope, the consequences of which are that the horses stand with their back-sinews uncomfortably stretched, and that rain runs off with such rapidity as gradually to cut deep channels and render the surface uneven.

The stamping of the horses during the rainy season causes the ground, particularly under the hind-feet, to be worked into holes. To remedy this it is the custom to pave such spots with bricks or stones. Care should be taken to remove them after the rains have ceased, otherwise urine will collect underneath and decompose.

GOVERNMENT STABLES.

Government stables in India are built by the Public Works Department, and usually consist of little else than a roof supported by iron or masonry pillars. This is all that is required, or that is even advantageous during a great part of

the year, for except in the depth of the cold season there cannot be too free a circulation of air.

ROOFS.

The roof is generally made of tiles, or corrugated iron. The latter, so far as I have seen, is always single, but ought certainly to be double, with a space of two feet between the inner and outer layers. Such an arrangement, especially if the outside of the upper layer were painted white, would keep out the heat of the sun much more effectually than a single roof.

JHAMPS AND CHICKS.

Towards the more northern parts of the Bengal Presidency the winds are sometimes very cold in the winter-time, and the horses are much benefited by protection from them such as can readily be given by what are called jhamps or chicks. The former are portable screens, formed by fixing long grass like thatch into a frame of bamboos.

Chicks are made by weaving strong cord round thin pieces of split bamboo, so as to hold them closely side by side in a horizontal position, something like the laths in a Venetian blind. They are much more durable than jhamps, but do not give so much protection from the winds. Of course the climate of a station decides which are preferable. Unfortunately in many garrisons, where they would be beneficial, the stables are not provided with them; but they should be supplied for all stations from Lucknow northwards, and would often be useful at night as far to the south-east as Dinapore.

BLANKETS.

In the colder stations great attention should be given to the quality of the blankets with which the horses are provided by Government. They are all country made, and are sufficiently long and broad; but are often so thin that the daylight can easily be seen through them. A blanket to be really good ought not to weigh less than six pounds; but in some districts it is very difficult to procure them of that

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weight. It would add greatly to the comfort of the horses if the ends of the blankets were fastened together by some of the broad native tape called *niwār*, so as to keep them close round the breast and hind-quarters when the wind blows.

ROLLERS.

The rollers with which the blankets are kept on require frequent inspection. The pads are not so well stuffed as those of English make, and after a time become pressed so flat that the central portion rests upon the spine, and not unfrequently makes the back sore.

POSITION OF STABLES.

In building stables sufficient attention is not always paid to the direction in which their ends lie, a point of great importance. They should be made with their sides opposed to the prevailing winds, in order that the air may sweep freely across them.

When there are two or three lines of stabling they should, if the ground is large enough, be built in *echelon*, so that the emanations from one may not be blown into the other. When this is impossible they should be as far apart as the space will allow.

In order that there may be no impediment to the free passage of air in every direction, stables should have no buildings near them; and, above all, they should be as far as possible from the regimental bazaar, because it swarms with flies and affords too much facility for the abstraction of the horses' food.

FLOORS OF COVERED STABLES.

The flooring of the Government stables is sometimes very defective, being in certain stations composed of porous earth, into which urine easily soaks. I have even known it made of mud taken from the bottom of a dry tank, and full of decaying animal and vegetable matter.

Floors of solid concrete, or of firebrick set in Roman cement,

so as to be perfectly waterproof, would no doubt be preferable to any others; but unfortunately such floors are too expensive for India.

The best of those made by the Public Works Department are constructed with a mixture of clay, kankar, and sand. These materials are finely divided, and made into a kind of stiff mortar before being laid down. They form a solid, hard mass, at first almost impervious to urine; but are usually not more than four or five inches thick, and without a proper foundation. The consequence is that they soon wear into holes, and are broken through by the trampling of the horses, so that urine escapes into the porous soil underneath.

If such floors were laid upon a bed of clay rammed into a solid mass, the upper layer of clay being mixed with the kankar and sand before being rammed, and if the layers (a foot thick altogether) were beaten into as compact a mass as possible, and then made smooth on the surface by smearing over it a thin mixture of the kankar, clay, and water, they would be very durable.

They should be left for fully six weeks before placing horses upon them, in order that they may become thoroughly dry and hard. The reason why it is advisable to mix sand with the kankar and clay is that in process of time it forms with them a substance far harder than kankar and clay alone.

I did not recommend it to be used in the flooring of unsheltered horse lines for two reasons:

1. During the rains a great deal of the surface is made into mud by the trampling of the horses, and the sand in such mud would be very irritating to the skin of the horses' heels and coronets.

2. During breaks in the rains the flies are such a torment that horses are perpetually stamping, and as those of native cavalry are unshod behind, their hoofs, being softened by the wet, would be worn away upon a surface rendered gritty by sand.

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FLOORS OF CLAY ALONE.

When kankar is not obtainable, a floor of clay alone, made as described in the remarks upon unsheltered lines, is very good. The flooring was of this kind at the Government stallion depôts in the Punjab, containing as many as 150 horses and 40 donkeys. During the three years that I was in charge of them, there was not a single case of disease which could be ascribed in any way to the effect of impure emanations from the ground.

When sheltered from rain such floors ought to be made perfectly level, for any slope is to some extent uncomfortable to the horses; and unless the fall is considerable, the urine does not readily run off, but partly dries and partly sinks a little into the clay.

KEEPING CLAY FLOORS CLEAN.

The best plan for keeping clay floors sweet and clean, is to have a small heap of finely-powdered dry clay always ready behind every two horses. Some of this should be sprinkled over any spots wet with urine, which is thus absorbed, and can be carried away to the manure-heap. All the places stained by urine during the night should be scraped clean with a small kind of iron spud called a karpā, which is in general use among grass-cutters.

The slight hollows formed by the scraping should be at once filled in with the powdered clay, which should be patted down smooth and hard with a heavy flat-sided piece of wood, similar to that used by native masons for smoothing the floors of dwelling-houses.

The stains from urine on concrete floors should be sprinkled with dry clay and brushed clean, not scraped with a karpā, as that would soon form holes which could not be instantly repaired, as they can in clay-floors.

CHÄTTIES.

Another plan of great assistance in keeping the floors clean is that of supplying one of the small earthen vessels, called chätties, for every two horses.

When a sais, or native groom, sees an animal about to stale, he takes up a chättie, catches the urine, and carries it away to the manure-heap. Chätties are so extremely cheap, that the cost of supplying sufficient for a whole regiment is trifling.

Captain Hayes, in his excellent book on 'Horse Management in India,' condemns the above practice, on the ground that it teaches horses to abstain from staling for an injurious time; but I never knew one instance of its doing so among the thousands of horses of which I have been in charge.

All the above-mentioned precautions seem excessive to one accustomed only to English stable management; but it should be remembered that far more attention to cleanliness is required in a hot than in a cold climate. Many stable floors in England, upon which horses stand all their lives with impunity, would be very unhealthy in India, on account of the great heat hurrying decomposition and favouring the production of those lower forms of animal or vegetable life by which many diseases are now known to be produced. The measures recommended were carried out in the stables of which I was in veterinary charge during the greater part of my service in India. They are not so difficult to enforce as might be imagined, because a native groom, called a sais, is supplied by Government for every two horses, to assist the European soldiers in their work. Constant watchfulness, however, is necessary, otherwise the saises will merely hide the urine with earth, which they will pat smooth and level with the rest of the floor, instead of carrying it away. In a day or two a strong smell of ammonia can then be perceived, and on scraping up the spots where the urine has been covered, the earth will be found black to a depth of one or two inches. Saies are also in the habit of throwing the urine which they catch in the chätties upon the open ground just

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behind where the horses stand, instead of carrying it to the manure-heap, and if not obliged to keep the floors clean they will give up taking the trouble of catching the urine at all, except when Europeans are present.

FLOORS SATURATED WITH URINE.

When such incessant care as is above described is not taken, the floors in the course of a few months will become saturated with urine to a greater or less degree according to the kind of materials used in their construction, and the way in which they have been laid down.

When much urine has soaked in they ought to be dug up and carried away to a distance, the space which they occupied being filled with entirely new materials. If this precaution be not taken, low forms of fever, resembling what is often called blood-poisoning, will be very likely to appear among the horses.

It seems almost unnecessary to speak of the necessity of carrying away the earth of which the old floor was formed; but I have, on repeated occasions, seen it merely dug up and rammed down again after some fresh earth had been spread over the top.

MANURE HEAPS.

The dung should be formed into a small heap about fifty yards from the stables. If at a greater distance, too much time will be required in going to and from it. It should be carted away daily, and if collected into a large manure-heap, this should be at least several hundred yards from the horse lines.

FLIES.

When nearer, the swarms of flies bred in it add greatly to the torment endured by the horses. In England people have no idea of what this torment really is like, especially at the latter end of the rainy season. The best way to mitigate it is to keep small heaps of litter, at short intervals, burning all day, in such positions that the smoke may be blown amongst the horses.

PICKETING OUT AT NIGHT.

A few yards in rear of the covered lines there should be standing room, where the horses may be picketed every night during the hot weather.

At that season the wind usually falls to a dead calm after sunset, and the heat is most stifling even under a shed with open sides, compared with what it is in a completely open place.

The mangers and pillars of the stables confine the air, and also absorb heat which they give out during the night; and the horses are in every way far more comfortable outside the roofed stables than inside, except when it is raining.

The ground upon which they are picketed should be covered with clay and kankar, rammed hard like that inside the stables; but instead of being level it should have a slope of about three inches from front to rear, in order that rain-water may run off it freely.

MANGERS.

Mangers are almost everywhere constructed of mud pillars with basin-shaped earthen vessels sunk in them, the edges being level with the top of the mud.

These vessels are frequently small and with round bottoms, in consequence of which the horses that are greedy feeders are enabled to swallow their food too rapidly. The vessels should be not less than a foot in diameter, and with bottoms almost flat. The grain can then be spread out in a thin layer, and the horses are compelled to eat it slowly.

Mangers of this kind have two great advantages—they are easily kept clean, and are very cheap, so that when a horse has any disease in the slightest degree resembling one of an infectious nature, there need be no hesitation in breaking the earthen vessel and pulling down the mud pillar.

PRIVATE STABLES.

I will here say a few words respecting private stables, as officers rarely keep their chargers with the regimental horses,

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except occasionally in stations near foreign territory where horse-thieves are plentiful.

In private stables there is usually far less attention paid to sanitation than in those belonging to Government: but the neglect does not produce so much disease as might be expected, because only a few horses are kept in them. It is well-known that when large numbers of either men or the lower animals are collected together on a small extent of ground, both the liability to and the virulence of disease are greatly increased.

For instance, people who breed one or two colts for amusement are seldom much troubled with strangles. The animals either escape it altogether, or usually have it in a mild form like that seen on farms in England. But in the late Bengal studs, where hundreds of colts and fillies were collected in stables, strangles used to be of an exceedingly severe type. A veterinary surgeon, who had been in the studs for many years, told me that he considered himself fortunate when the loss amounted to only ten per cent. annually.

Private stables are usually built with thick mud walls, and are roofed with tiles or a thatch of coarse grass. The latter is in some respects better than tiles or corrugated iron, being cooler in summer and warmer in winter; but it has the disadvantages of being liable to catch fire, and of harbouring snakes, scorpions, and other vermin.

The chief danger of fire arises from the saises and grass-cutters being in the habit of making their cooking-places against the stable walls.

Considering how frequently this is allowed by the owners of horses, it is surprising that fires are not more numerous.

The stables are usually walled in on all the four sides. This plan is preferred by many people, because it makes the interior warm in winter, and also renders it dark, and therefore less attractive to flies than it otherwise would be.

There is little objection to the plan provided the interior be wide, lofty and well ventilated, and the horses few in number; but, on the whole, such stables are, I think, less healthy than those which have walls on only three sides, and

are open at the rear like sheds, because the air in them is less pure. The darkness assists in concealing dirty floors, and the horses lose the beneficial effect which sunlight has upon all except nocturnal animals.

When only three sides of a stable are walled, the open end should be provided with chicks. These, while allowing a free circulation of air, assist in keeping away flies, prevent too great a glare of light, and afford shelter from cold winds.

LOOSE BOXES.

All horses in private stables should be allowed loose boxes whenever the space will admit of it. The gentle exercise which they take when walking around helps greatly to keep their feet and legs healthy.

The divisions between the boxes are readily made with mud walls about a foot thick. They should be built sufficiently high to prevent horses reaching over and biting each other, but should not be made higher, otherwise the ventilation of the stable will be interfered with.

The rear of each box is usually closed by strong wooden bars, about two feet apart, placed horizontally. Their ends rest in holes made either in the mud walls or in upright posts.

The saises and grass-cutters dislike boxes because they require an extra amount of bedding, and are less convenient for themselves to sleep in than a long open stable where every horse is tied. You should always endeavour to provide a sufficient number of houses for all your servants and their families. If, as is frequently the case, the accommodation is small, the attendants upon the horses are sure to be persuaded by the other servants to sleep in the stables. In order to avoid being trampled upon they will put heel-ropes on the horses, and make both these and the head-collar ropes so short that the comfort of the animals will be much interfered with.

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GHARĀS UNDER FLOORS.

A most detestable practice carried on by saises in some private stables is that of burying a large earthen vessel called a gharā in the floor under the place where each horse stands. This was formerly done in certain native cavalry stables, and I heard of at least one instance where the vessels were found in the lines of a British cavalry regiment. The object of so burying them is to form receptacles for the urine, and they are left undisturbed and uncleansed for months, or even years. When dug up they are invariably found full of putrid urine, the soil all round being saturated with it to a depth of two or three feet.

GROUND VENTILATION.

Ground ventilation is rarely properly provided for, although it is of great importance in all stables with walls. Its advantages are that it ensures a supply of pure air for the horse to breathe when lying down, and that it causes vapours or gases rising from the urine and dung to be at once carried off. One or more holes, about a foot square, should be made in the corners of the wall opposite the doorway, and a few inches above the level of the ground outside, so that rain-water may not enter through them. Each hole should be guarded by a wooden frame containing iron bars, or a plate of zinc perforated with holes about half an inch in diameter, so as to keep out jackals, dogs, and other animals. In very cold weather it is easy to protect the horses from draughts by placing some loose bedding against the hole, and thus breaking the force of the wind.

TO PREVENT ROBBERY OF GRAIN.

As some saises are in the habit of stealing the grain, many people have their horses brought to the veranda of the bungalow at each meal-time to be fed before them. It is, however, quite as good a plan to allow the horse sufficient food, and let the sais know that he will be discharged if the animal fall into bad condition. This system generally has

the desired effect, and is far better than the custom adopted by some of abusing, beating, or fining the man. It is true that numbers of the servants engaged by Englishmen on their first arrival in India are great scoundrels; but when a *sais* is paid regularly and is treated with justice and kindness, the greatest punishment that can be inflicted is to discharge him, and in the majority of cases he will treat the horse well in order to avoid such a misfortune. I have known an excellent *sais* made into a bad one by beating, but I never knew a bad one made good by it.

The custom of beating or abusing is disadvantageous in another way. It prevents respectable men offering themselves as servants, for the character of every officer is known in all the bazaars of a station shortly after his arrival.

Where several horses are kept, it often is a good plan to make the oldest *sais*, if he knows his work well, responsible for the feeding and grooming of all the animals, giving him about two rupees monthly more than the others. Make him also responsible that you be at once informed when any horse has a thrush, a sore back, or other ailment. Many of the natives are either too careless to mention such things, or are afraid to do so lest they should be blamed. They will consequently leave a thrush undressed, until the frog is full of maggots; or will cover over a sore on the back with cowdung or leaves beaten into a pulp, and place the saddle over it day after day until a large raw hollow has formed in the skin.

In many private stables it is usual to leave the bedding under the horses all day. A considerable portion of it is then almost constantly saturated with urine, which often causes thrushes in the horses' feet, and the floor is never perfectly dry. The litter should be cleaned out at morning stable-hour, and left all day to be purified by the sun and air.

MASĀLIH.

It is a universal custom amongst natives to give horses daily a mixture of spices, nitrate of potash, and salt, called by

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them masālih. In the small quantities given it probably does no harm, but it is certainly unnecessary. All that horses really require is salt, and measures should be taken to ensure this being given regularly.

HEEL ROPES.

Horses in India are usually fastened with heel-ropes in addition to the head collar-rope. The latter does not slide through a ring as in English stables, but is fastened to a peg driven into the ground close to the manger. The practice of using heel-ropes was adopted from the natives, and doubtless originated in consequence of nearly all horses being entire. Until about twenty years ago all the Government horses, except a few that were very vicious, were uncastrated, and it was generally believed that they were capable of more endurance than geldings; but they were much more difficult to manage, especially when on a march. Sometimes in the night one horse would break loose and attack his neighbours, who in self-defence would use their utmost endeavours, and often successfully, to break loose also. Many were thus often injured by bites and kicks, and the rest of the whole camp was disturbed. When crossing rivers in ferry-boats, although each horse's head was held by a man, a free fight often ensued, when some of the horses were kicked into the water and were carried a long distance down stream before they were recovered.

In consequence of these and other inconveniences, a cavalry regiment mounted on geldings was tried against one mounted on entire horses in the Madras Presidency, both being sent upon a march of six hundred miles. Although many of the geldings had only been castrated a few weeks before the march commenced, they were found at the end of it to be in quite as good condition as the stallions. After this trial the custom of castration became almost universal, at least in the European regiments.

It is, however, unnecessary with a large majority of the Arabs which are ridden as chargers. When not in close

ranks they are usually very gentle and good-natured, and, as a rule, the higher the caste the more quiet an Arab is.

Heel-ropes certainly prevent many kicks; but they are used to an unnecessary extent, being in some regiments and batteries placed upon all the horses, even on those which are never known to kick.

When any horses have their places in the lines changed, it is well to secure their hind-legs for a few days, until they and their neighbours become accustomed to each other; but if they appear to be perfectly friendly, the ropes may be discontinued with little risk, and with a great increase of comfort for the animals.

With regard to those horses upon which the heel-ropes are kept permanently, constant watchfulness is required, in order that they may stand and lie down with ease. Many saises take an extraordinary delight in making both head and heel ropes so short that the horses can scarcely move a foot to the right or left, and they will sometimes shorten the ropes contrary to orders after the Europeans have left the stables. Horses may be seen with their heads tied down below the natural height, and with their hind-legs stretched far backwards. Without doubt very short heel-ropes are one cause of ring-bones, and of sprains in the hocks and loins.

Both head and heel ropes are fastened to strong pegs driven ten or twelve inches into the ground.

PICKETING WITHOUT PEGS.

I will here describe a method of fastening which it may be useful to know if you ever happen to be without picketing-pegs. I was shown it by some natives, and found that the plan answered perfectly with six hundred horses of which I was in charge, with only one European assistant, during a seven weeks' march.

With the small spud, called *kurpā*, used by grass-cutters, make a hole about three inches in diameter, and eight to twelve inches deep, according to the hardness, or otherwise, of the ground. Tie a knot at the end of the rope, and drop this to the bottom of the hole, then fill in with earth, ramming it

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firmly. The most powerful man cannot draw this out of the hole perpendicularly, and with a proper length of head-collar rope a horse has no chance whatever, because he must necessarily pull in an oblique direction. The saises in charge of quiet horses usually regulate the depth of the hole and the amount of ramming, so that they can draw up the rope with one long, steady pull. This system would of course fail in loose, sandy soil, but never does so upon land of ordinary firmness.

EYE-FRINGS.

Horses are universally provided with eye-fringes in order to protect the eyes from flies and mosquitoes. Great care should be taken that they are in good repair, and always kept on, except during the cold season of the year. There are two kinds of fringes in use—one made by splitting a thin piece of leather into the shape of a comb. The other by plaiting string into the same shape. They are fixed on to the forehead-band of the head-collar.

GROOMING.

It is unnecessary to go into details about grooming, which is carried on in essentially the same way as in England. It should be remembered that the horses are, on the average, far better bred than those used at home, and that therefore it is still more necessary than in this country to prohibit the application of the curry-comb to the skin. The hind-quarters of horses may sometimes be seen covered with patches of white hairs, owing to the follicles having been injured by the teeth of the curry-comb while the animals were changing their coats.

WASHING.

Another point of very great importance is to prevent the saises washing the horses all over. If not watched they will frequently do this to save themselves the trouble of grooming; and as they rarely more than half-dry the coat, a common result is the production of itchy skin or a catarrh. The head-

man of the saises, called Jemmadār, should always be held responsible that horses are not washed in the absence of Europeans. Even when the hair is well dried it becomes harsh, and does not look so glossy as when cleaned by grooming. If prevented from washing the whole skin, saises will still frequently wash the mane and tail, when the hairs become full of scurf through not having been parted and brushed daily.

CLIPPING AND SINGEING.

Many horses in India have thick coats in the cold season, and suffer from them when at work in the same manner as at home. Clipping is then very beneficial, provided that they are warmly clothed with two rugs each, and are well sheltered from the cold winds while standing in their stables.

When out in camp in the northern parts of India, where there is frequently a sharp frost at night, singeing is better than clipping, because the hair can be left by the former method long enough to keep the animals warm, while shortened sufficiently to prevent their sweating too much while at work.

DRINKING WATER.

The drinking-water with which the horses are supplied requires continual attention. It is sometimes obtained from tanks dug near the stables, but usually from wells. The tanks are occasionally so situated as to receive the drainage of the ground around the bazaar, and are thus necessarily very impure.

In any case they are objectionable sources of water supply, for great numbers of natives wash their clothes, and bathe in them daily; and the water, being stagnant, swarms with the lower forms of animal and vegetable life.

The wells usually contain fairly pure water if properly looked after, but when neglected they become very filthy. Every well should be surrounded with a low wall or platform in order that the surface drainage of the neighbouring ground may not run into it; and it should also be covered

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so as to prevent dust, leaves, and insects from dropping in. Without this precaution a mass of black putrid mud, sometimes two or three feet deep, will gradually accumulate at the bottom.

On looking into an uncovered well there will frequently be seen a quantity of dead beetles and other insects floating about, as well as live frogs and snakes. The last of course soon die, and assist in polluting the water.

DRINKING-TROUGH.

The trough from which the horses drink is rarely supplied with running water as in English troop stables, but is filled with water drawn from the wells, in large leather bags, by the help of a pair of bullocks. It should be scrubbed and washed out daily, otherwise it soon becomes foul from dust and from the saliva of the horses dropping into it when they are drinking.

When horses are taken to the trough a European should be present in order to ensure their being allowed to drink as much as they require. Some natives think that much water is injurious, and like to lead away the horses the first time they raise their heads while drinking.

During the extremely hot weather soldiers are not allowed, except in individual cases, to leave the barracks between about nine in the morning and five in the evening. During those hours the saises alone feed and water the horses. The European stable-orderly ought to be present when they do so, partly to ensure every horse being taken to the drinking-trough before and not after he is fed, and partly to ensure every horse receiving his food.

Horses ought to be watered fully *half an hour before* they are fed, and in very hot weather should be taken to the trough four times daily.

DRIED GRASS.

In India real hay is rarely to be obtained. In some parts of the country the grass, when long, is cut just above the

ground with a tool like a small reaping-hook, and dried thoroughly, then collected into sheds and kept for use. It is, however, dried too much, instead of being saved and stacked in such a way as to ensure that slight fermentation which develops the sugar and the aromatic principles existing in real hay that make it so attractive to horses.

The rule throughout the country is that the grass, except during the rains and for a few weeks after they have ceased, is cut daily as required when only from one to three or four inches high. The instrument used by the grass-cutters is a short-handled spud called *kurpā*, which detaches the grass along with a portion of the root just under the surface of the ground.

It might be supposed that grass-land would soon be destroyed by such a system as this, but when there is a little moisture in the air, even a light dew, the grass soon recovers. No doubt the stirring of the earth assists it by facilitating the absorption from the air of ammonia, carbonic acid, and oxygen, by which the constituents of the soil are decomposed and food is formed for the plants. Turf, such as we have in English pastures, would be greatly injured by a frequent repetition of such treatment, but in the dry lands of hot countries there is no turf, the grass growing in tufts at short distances one from the other.

TREATMENT OF FRESH GRASS.

The grass after being cut should be beaten, so as to shake off the greater part of the earth and the small stones or sand which may be adhering to the roots. Grass-cutters are very fond of leaving as much earth on them as possible in order to increase the weight. A small quantity of mould would not be injurious, and might, in some cases of acidity from indigestion, even be useful; but sand rapidly wears away the teeth, and stones are likely to chip off portions of them.

WETTING GRASS.

Grass-cutters sometimes wash the grass and bring it home when half dry. It is then of a brighter colour and heavier than when unwashed. This practice should on no account be permitted.

Standing grass is not injured by rain or water rising into it gently; but when it has been cut, beaten to free it from earth, then tied in bundles and carried for miles, it is so bruised that the outer shell and sap-vessels are broken. Water then washes away a quantity of the sap, and penetrating into the interior of the stalks and blades causes rapid decomposition, which can only be stopped by the grass being spread out thinly and quickly dried. If this precaution be neglected the decomposition is liable to continue after the grass is eaten, and cause bad attacks of colic. Even when not wet, green grass ought always to be opened and spread out to dry shortly after it is brought home, for if left in bundles several hours it is liable to at least a slight amount of injurious fermentation. During the rainy season and early part of the cold weather there is an additional reason. The grass is so full of moisture that it has a tendency to bring the horses into soft condition. The best plan then is to make such an arrangement that the grass-cutters may come home with their loads by midday at the latest. The bundles should at once be weighed, and afterwards examined to find out whether they contain too much earth, or weeds, or swamp grass. They should then be spread out and left to dry until the next day before being given to the horses. In the hot weather from March to the commencement of the rains, the grass, unless grown on moist land, requires no drying, and may be given shortly after it is cut.

QUANTITY OF GRASS FOR EACH HORSE.

The quantity required by each horse depends partly upon the breed and other peculiarities of the animal, and of course partly upon the quality of the grass itself.

Most Australian horses, from having been reared almost exclusively upon grass in their own country, require large quantities of it to keep them in good order. Government allows them one sir (about two pounds) of grain daily more than horses of other breeds ; but this is quite unnecessary if they receive all the grass they require, which should be about twenty-five sir (about fifty pounds) daily, when of fair average quality and weighed before it is dried.

Stud-bred horses have been reared upon a more moderate quantity of grass than Australians. Arabs have not been accustomed to much in their own country, and are usually smaller animals than stud-breds. Country-bred horses, as a rule, thrive upon a moderate amount of food, whether grass or grain, because they are accustomed to it from the time they are weaned. The majority of natives habitually under-feed their horses except during and shortly after the rains, during and after the harvests, and during the time when the green wheat is young.

As a rule, therefore, stud-breds, country-breds, and Arabs will thrive upon about sixteen to twenty sirs of grass daily, according to their size. The whole of this is not eaten. Horses reject a considerable quantity of the roots and many of the coarse stalks and weeds. A certain quantity is also spoilt by their trampling upon it.

BEDDING.

Bedding is usually made from the dry portion of the grass which is left uneaten, together with various kinds of tall, coarse grass cut specially for the purpose. One of the most common kinds used is a species called *kās* or *kāns* in Hindustani, and *chāngā* or *chāngi* in the Punjab. It is the *Saccharum spontaneum* of Linnæus, and the *Pragmites communis* of English botanists. It grows to a great height in soils where water is close to the surface, and when ripe the seed-heads are covered with a kind of down like raw cotton. When green it is so sweet that sugar can be distinctly tasted in it if chewed. Horses therefore are rather fond of eating it

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in spite of its coarse, indigestible stalk, unless it be first dried for two or three days in a hot sun.

GRASS FROM SWAMPS.

It should be an invariable rule never to feed horses upon grass grown in swamps, on account of the numerous lower forms of animal and vegetable life found in stagnant water. Horned cattle living on swampy land are particularly liable to anthrax, and there is no doubt but that the very fatal disease, called in India Loodiana fever (a form of anthrax), is often caused by horses either drinking stagnant water or eating grass grown in it. Worm in the eye also appears to be produced in the same way.

MAKING HAY.

During the rainy season there are some days in which the rain falls in such torrents that it is impossible for the grass-cutters to go out. As a provision against such occasions, or against the chance of failure of grass, it is customary in many batteries and regiments to make the men bring in an extra daily quantity of grass when it is plentiful. This is dried and made into ricks. Of course it is not to be compared with proper hay. That which is cut at the early part of the rainy season is immature, and contains little nourishment; that which is collected some weeks after the rains have ceased is little better than straw, owing to most of the nutritive constituents having been expended in forming the seed, and the sap remaining in the stalk having turned into woody fibre. Then again, as the grass, after being dried, is added to the rick in small quantities daily, it does not, what is called in England, heat—that is, it does not undergo the slight fermentative process by which the dextrine of the sap, as in properly made hay, is converted into sugar, while various aromatic properties are developed.

Unfortunately at most stations the grass is cut from waste pieces of ground, or from the lands of the native farmers, often without their consent, and is consequently procurable

only in small quantities daily, so that there is no chance of making real hay from it.

RAKHS.

At a few stations there are large tracts of jungle-land set apart by Government for the purpose of supplying the troop horses with grass. They are called *rakhs* in Bengal. Whenever a regiment or battery is fortunate enough to be at such a place, a supply of good hay ought to be made every year. It is wanted when the grass-cutters are kept at home by heavy rain, and still more in that part of the hot season before the rains commence, when the grass remaining on the land is so burnt by the sun that it contains scarcely any nourishment, and is particularly liable to cause colic and other abdominal disease.

In the districts of Bengal south of the Punjab there is sometimes a difficulty in making first-class hay, owing to the rainy season being so protracted that it is not over before the mass of the crop has gone out of bloom. The utmost that can then be done is to cure it while the stalks are green and before the seeds are mature. There will even then probably be some of the late kinds of grass still blooming.

In this way, if advantage be taken of occasional dry days, hay can be made that is decidedly better, as I have proved by actual experience, than most of that which is given by contractors to troop horses in England.

At the latter end of the rainy season there are usually intervals of fine weather every few days. It is therefore often a good plan to begin cutting the grass after two or three successive days of rain before it has stopped, as there will very likely be sunshine about the fourth or fifth day.

The sun being very hot, the hay is made in far less time than in England. In the Punjab, when not interrupted by rain, grass can be cut on one day and stacked on the afternoon of the next.

If the weather will permit, the time for making hay should be chosen when the grass which is both most plentiful and also best for making forage is in bloom.

If, for instance, the land produces about equal quantities of spear grass and jānowa, as the former is inferior to the latter and also ripens earlier, it is well to wait until it has begun to run to seed, by which time the jānowa will be in full bloom.

There may of course be now and then a year, as in England, when rain will last so long that the grass after being cut will have a great deal of its sap washed out before it can be stacked; but even then it will certainly be no worse than that which is now made into stacks, as above described, from the extra quantity daily brought in by the grass-cutters.

OXALIS.

In some parts of India a plant called by the grass-cutters wild lucerne grows in great quantities, and is brought in by them as part of the grass ration. At first sight it looks like a small kind of clover; but, on closer examination, it will be found to resemble almost exactly the English oxalis, to which it is, I believe, closely allied. The horses will not eat it if they have enough grass, and it should not be admitted as part of the ration. It does not appear to be in any way mischievous.

DHUB.

The most common grass throughout India, and fortunately one of the best for forage, is the *Cynodon dactylon*, called dhub in the Bengal Presidency, and hariāli in Madras. It flourishes at all altitudes, from a few feet above the sea-level to 3,000 or 4,000 feet; but at the last height it is, so far as I have seen, only found in sheltered valleys.

Where there is a little moisture in the earth it grows and blossoms at all seasons of the year, except when there is actual frost at night in the depth of the cold weather.

In dry districts it runs along the surface of the ground, sending down a bunch of roots like a strawberry at intervals of a few inches. If on rich soil it grows during the rains in a luxuriant mass to a height of eight or ten inches, and can be made into hay. In districts like that of Lower Bengal,

where there is a moist atmosphere during nearly the whole year, and where the soil is also rich, the grass often loses its habit of sending out runners with bunches of roots. It then grows like ordinary grasses to a height of twelve or eighteen inches.

SPEAR GRASS.

Spear grass (*Heteropogon contortus*), called lam in the Punjab, is also very common in some parts of the country. The spears are long barbed processes at the end of the seed-covers. It is good fodder if given before the spears form, and even afterwards horses will thrive upon it if it is well beaten so as to shake them off. When this precaution is not taken a horse is sometimes found unable to eat, and on examining him, a quantity of spears are found embedded in the mucous membrane of his mouth, generally under the tongue or in the roof.

JĀNOWA.

Digitaria sanguinalis (called jānowa in Hindustani, and poliaong, in the Punjab) is an excellent forage grass, and makes first-rate hay. It has small processes on its seed-covers like spears, but they are not sufficiently stiff to be of any consequence even when ripe.

The grass is exceedingly plentiful in many districts.

The above-named three grasses are about the most universally diffused in the Bengal Presidency. There are many other kinds which are good for forage, but they are, I think, more local, being plentiful in certain districts and not found at all in others.

MANIĀRA.

In the Himalayas the finest of all grasses, superior even to dhub, is a kind called maniāra by the natives, and *Pennisetum triflorum* by English botanists. It grows to a height of four or five feet during the rains, when on a soil formed of vegetable mould and decomposed limestone, which seems to be peculiarly well adapted to it. It contains an extraordinary amount of sugar, and has a fine, soft, easily

digested stalk and blade. As it flourishes where there is a great deal of frost and snow in the winter, it is very probable that it may be grown in England; and if so, it ought to be a valuable addition to English grasses. I obtained some of the seed last year, and it has been planted for trial in two or three places.

As a general rule coarse grass is not so good for horses as the finer kinds, but there are exceptions, and the only certain way of finding out their qualities is by actual experiment. There is, for instance, a very coarse kind of grass with stems as thick as wheat straw and rough-looking flower-heads, which grows in masses four or five feet high during the rains in the rocky parts of the plains in Central India. No one new to the country would think it good food, yet horses thrive upon it, keeping both healthy and fat. It is a good rule for those who have trustworthy and experienced scribes to ask their opinion about grasses of which there is any doubt.

When on the march there is frequently no waste land from which the grass-cutters will be permitted by the natives to cut grass. It is then necessary to buy it from men living near the camping-grounds, who supply it sometimes in a green and sometimes in a dry state.

BAD GRASS SOLD AT CAMPING-GROUNDS.

These natives are in the habit of trying to sell the worst they possess, often such as has been collected in swamps, or grass which, being very bad, they have bought at a cheap rate. They will vehemently assert that no other can be procured, and if the officer in charge of the horses take the grass, the same trick will very probably be tried at other halting-places.

The best way to avoid being imposed upon in this manner is to take a sufficient quantity of good dry grass for at least one day's consumption, carrying it in bullock-carts along with the troops. Then at any camping-ground, if bad grass be produced, refuse to buy, and leave the whole of it in the hands of the dealer. The news of this is sure to travel in

advance and cause good grass to be supplied, most probably for the whole remainder of the march.

Should there be no means of keeping a reserve of grass with the troops, and any difficulty be experienced in obtaining it of good quality, the conduct of the dealers should be reported to the civil officers in charge of the districts through which the troops will march, and they should be requested to let their subordinates take measures to ensure the grass being good at the halting-places in advance.

It is only during a season following a general failure of rain that there is any difficulty in procuring grass of at least fair quality, except in some of the most densely-populated parts where every yard of ground is cultivated to the edges of the roads, or else in the rainless districts of North-Western India.

GRAIN.

The grains upon which horses are usually fed are : gram, barley, oats, kulthi, and some kinds of millets.

Gram, called *chānna* in Hindustani (*Cicer arietinum*), is the product of a small leguminous plant, with a purple flower like a vetch. It is the most common food in the Bengal Presidency. When good, the grains are of a reddish-brown colour of various shades, hard, free from smell, and heavy enough to sink in water. If chewed they taste something like a pea. When gathered before they are ripe many of the grains acquire a greenish-olive colour, turning black with age, and becoming extremely hard. These have a bitter taste when chewed, and when soaked in water they do not swell readily like good grain.

When the grain has been exposed to wet or stored in a damp place, it is liable to become mildewed, or to have a sour or musty smell. Gram is subject to the attacks of an insect which bores small holes in the skin and eats the flour inside. It will then float upon water. A small proportion of grains so affected is of no consequence ; but where they are numerous the gram should be rejected, for of course it contains less nutriment than when the grains are perfect.

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Gram is not considered quite wholesome until six or eight months after it ripens ; therefore, as it is harvested in March or April, it should not be given until the following October. The usual allowance, when unmixed with other food, is from four to five sirs daily to horses of average size. The grain which is supplied to troop horses is roughly ground, usually in native hand-mills called *chakki*, but sometimes in English oat-crushing machines.

It was formerly the custom to soak it for several hours before giving it to the horses ; but this is now, I believe, seldom done except in private stables. The practice is injurious in various ways.

1. The gram becomes so soft that greedy horses swallow quantities of it half masticated, and before it is so well mixed with saliva as it ought to be, in order to ensure the proper digestion of the starchy portion.

2. In hot weather the soaking sets up a fermentation, which often makes the grain actually sour. The acid thus formed is injurious to digestion, and the fermentation is apt to continue after the grain is eaten, producing colic, which sometimes ends in ruptured stomach or intestine.

3. When, as is often the case, too much water is used, a great deal of the nutriment is dissolved out. Some men are so well aware of this that they give the superabundant water to weakly horses to drink.

Gram, after being passed through an English oat-crushing machine, may be given perfectly dry, in which state a horse is compelled to masticate it thoroughly before he can swallow it. A small portion, however, in crushing is turned into actual flour, and a very considerable quantity when it is ground in the native hand-mills. As this is to some extent blown away, when dry, by the horses' nostrils, the better plan is to wet the grain sufficiently to make it damp just before it is given. Actual soaking should on no account be sanctioned, for if permitted at all it is almost certain to be continued to an injurious extent.

Gram is sometimes given both uncrushed and unsoaked. I have not known any injurious effects from this practice ;

but some of the grains are pretty sure to be coated with saliva and swallowed whole, and eating them uncrushed must be hard work for the teeth.

Mr. F. F. Collins, late P.V.S. in India, speaks highly of the system of giving gram uncrushed, but soaked in water for some hours until soft. When treated in this way it does not ferment like ground gram, but undergoes the same change as when in the earliest stage of germination, the starchy matter being partly converted into sugar.

BARLEY.

Barley, called in Hindustani *jai*, forms a large proportion of the grain given to horses in the northerly parts of the Bengal Presidency, and especially in the Punjab. It should never be given unless crushed or ground after having been first *parched*. It is then very excellent food. The ordinary hand-mills of India are not capable of grinding it properly when unparched, and a considerable portion of the grains pass through them unbroken. Mr. Hurford, who was P.V.S. in India some years ago, stated in his official correspondence that hand-mills half as heavy again as those in ordinary use, and cut with a sharper surface, would grind barley properly; but mills of this kind are not common, and it is doubtful if they could easily be procured except in certain districts. It is usually given unparched, and the dung then contain large quantities of whole grains which have passed through the mill, or of the whole husks of those which were merely flattened in the English oat-crusher. These irritate the digestive organs to such a degree that they are liable either to cause frequent attacks of colic or to greatly aggravate that itchiness of the skin with which numbers of horses are troubled every hot season.

When the barley is properly parched neither of these results ensues. The hand-mill or the oat-crusher readily breaks the husks into powder, so that they do not cause any irritation, and the starch granules being burst by the heat are rendered easily digestible.

Parching is done in every bazaar by putting the grain into

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a large copper or iron vessel over a fire and constantly stirring it round. If this stirring be neglected, the grains on the bottom of the vessel are liable to be spoilt by charring until black.

KULTHI.

Kulthi is rarely given in the Bengal Presidency, but is a common food in Madras and Bombay. Like gram, it is the seed of a leguminous plant, which is called by botanists *Dolichos biflorus*. The flower is of a sulphur-yellow colour. It is considered by owners of race-horses to be excellent food for training upon; but it is rather expensive to use, being so hard that it requires to be well boiled before being given.

MAIZE.

Maize, called makki or makkai, is rarely supplied for horses except when other food is very scarce and dear. Being hard and tough, it ought to be passed through a crushing machine. Given for a short time, or in small quantities mixed with other food, it has not, so far as I have seen, produced any ill effects; but in full allowances it soon causes the dung to smell badly, and owing to its containing a large quantity of oily material it makes horses soft in condition, at least in a hot country like India.

In North America horses frequently have no other grain, and seem to work well upon it, probably in consequence of the long cold winters counteracting the effects of the fat-forming materials. Even in that country it is not adapted for putting horses into racing condition. Hiram Woodruff, the noted trainer of trotters, says, 'There is no doubt at all about the fact that oats are the best food for a horse. Keep the maize for bullocks and hogs.'

In moderate quantities it is a good food for brood mares, greatly increasing the flow of milk.

In the *Veterinary Journal* for January, 1879, is a short article upon this food. It states that 'the attempt made in France to feed horses upon maize instead of oats has failed. According to reports sent in by French army officers to

Government, it has been found that in whatever proportion maize be substituted for oats, loss of muscle and energy manifests itself ; besides which, horses sweat inordinately and are easily blown.'

In Austria 5,200 army horses were fed partly upon maize for six months. They increased in weight and had very glossy coats, but seemed to lose in vigour as compared with those fed upon oats. This was particularly noticed in the fast paces, in which they sweated far more profusely.

The Vienna Tramway Company made similar experiments, and found that the saving in cost of food did not compensate for loss of power and speed.

OATS.

Oats can rarely be procured except in certain districts, but are grown in considerable quantities in Tirhoot and in the neighbourhood of Hapur, near Meerut. The former district being moist and the latter dry, there is little doubt but that they would thrive in any part of India.

It is a pity that they are not cultivated extensively, for although inferior to good European oats, being more husky and less full in the grain, they are the most wholesome food that can be given to a horse, decidedly superior to gram or barley.

Captain Hayes, one of the best authorities upon horse management in India, in his book upon Training, says : ' My experience is, that even with Indian oats a horse can be got at least seven pounds better than when any other grain is substituted.'

Large quantities of oats were grown upon the farm lands of the late Bengal studs. The unthrashed straw was chopped into pieces about an inch in length and mixed with other food.

MOTE.

Mote is a grain much used by native horse-owners. It is called mung or mutki, and its botanical name is *Phaseolus aconitifolius*. Like gram, it belongs to the leguminous order of plants.

BAJRA.

A kind of millet, called bājra, is given by natives to their horses in many parts of the country, but never, so far as I am aware, by Europeans. It is a small grain about one-third the size of barley, has a very thin white skin, and is stated to be wholesome food.

Another sort of millet, called jowár (*Sorghum vulgare*) is also a good food. The mares of the Belooch tribes in the Western Punjab receive scarcely any other grain, and perform the severest marches upon it.

LINSEED.

Linseed, called alsí or tísí, is a very useful food, given occasionally as in England to horses in low condition. About half a pound night and morning is sufficient for a horse of average size. The best way to give it is to boil it until the grains burst, using sufficient water to keep it covered; then stir in dry bran until it forms a stiff mass. In this state the horse is obliged to masticate it to some extent, and thus mix saliva with it. In the hot weather it ought to be boiled not long before it is given, for if kept cool for some hours it will turn sour.

Linseed-tea is often useful for sick horses. When making it the linseed should not be boiled, because the oil which is in the interior would be extracted, and might disgust the patient. The proper way is to pour boiling-water over it in the proportion of two gallons to one pound, then cover the vessel containing it so as to keep in the steam, and let it stand till cold. In this manner only the gelatinous coating on the skin will be dissolved and diffused in the water, forming an easily assimilated nourishment.

BRAN.

Bran, called chokar, should form part of the food of every horse. It assists in keeping the bowels regular, and its gently stimulating action upon them is communicated by

sympathy to the liver, lessening the tendency to sluggish action of that organ, which is frequently observable in the hot weather. This want of activity, causing a diminished secretion of bile, may be known by a disagreeable smell in the dung, and may be corrected usually by a few bran-mashes.

In the cold season when the horses are regularly worked, a good bran-mash once a week, in place of the usual feed of grain, is all that is required as a rule; but in the hot season it is a good custom to give bran daily mixed in the other food.

In stations where barley is cheaper than gram, it must, by Government order, form part of the rations. In such places the best food for the hot weather is a mixture of one sir of bran with one and a half sirs each of barley and gram. I am convinced from experience that a large proportion of bran like this assists in preventing the tendency to itchy skin, from which so many horses suffer.

Indian bran, owing to the imperfect manner in which it is dressed, is far more nutritious than English, containing a considerable quantity of flour. It should always if possible be procured from the Government bakery, whence the soldiers are supplied with bread. That which is bought from the contractors is apt to be greatly adulterated with husks of rice or barley, and worse still, with fine sand. I have known this carried to such an extent that the sand could be easily felt when rubbing the bran between the fingers. Of course a mixture of this kind is very injurious, wearing away the teeth and frequently causing colic.

CARROTS.

Carrots, called gājar by the natives, are grown near many of the large military stations, and though much smaller than those of England, are good enough to form a beneficial change to the horses, and should be given in quantities of one sir daily to each. Unfortunately they do not come into season until after the commencement of the cold weather.

These and other variations from ordinary diet, such as linseed, are readily procured at the market rates from the

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forage contractor, by allowing him to deduct the value of them from the grain ration.

LUCERN.

Lucern should if possible be grown for the horses of every battery and regiment, as it is a very agreeable change of food in the hot season, and may be given in quantities of six or seven pounds daily to each horse. Horses required for hard work ought not to have more than half the above amount in the cold season. Very few Europeans in India seem to know how to grow it properly. The amount obtained from a given quantity of land depends greatly upon the way in which it is managed. It is sometimes sown broadcast or in rows upon ground which has been simply ploughed and then made smooth. Grown in this way it is seldom luxuriant, and when irrigated the lower parts of the stalks are soiled by standing in the water.

The best system of preparing the ground is firstly to spread over it a quantity of rotten stable manure; plough this in, pulverize the earth as finely as possible, and then make it into ridges a foot high and eighteen inches to two feet apart. Having beaten the ridges into a compact mass with a spade, plant the seed thinly and not more than half an inch deep along their tops. This should be done either in the cold season or during the latter part of the rains. If at their commencement, the ridges and furrows will be washed level and half the seed buried deeply during some of the violent storms. The rain falls much more gently at the latter end of the season, and for some time afterwards in the cool weather the heavy dews afford all the moisture required to make the lucern strike its roots deeply into the soil. It should be cut when just breaking into bloom. When the dews cease to be heavy, the lucern will require irrigation, and if this be properly attended to it will give a fresh crop about every two months, sometimes even more frequently. Of course, if planted late in the season when dews have ceased, irrigation must be commenced at once, otherwise the seeds will not readily germinate. The water running down

the furrows soaks into the ground where the roots are, without reaching to and spoiling the stalks.

In good rich soil lucern managed in this way grows to a height of eighteen inches or two feet, but in poor soil it is rarely more than eight or ten inches high before it begins to bloom. It should not be allowed to run to seed, because a great deal of the nutriment is then lost, and the stalks begin to harden.

In very sandy soil the system of ridges and furrows does not answer well, on account of the earth drying too rapidly.

It is better then, after ploughing in the manure, to make the ground smooth and level, plant the seed in lines, and allow the lower part of the stalks to be spoilt by the water used in irrigation. The lines in this case should not be more than one foot apart, in order that the plants, being close together, may shade the soil from the sun and so help to keep it moist.

One difficulty that may be encountered on first starting a lucern plot arises from the fondness which ants have for the seed. In loose soil they will take up and carry away a large proportion, if they happen to be at all numerous. I know of no remedy in such a case except planting a larger quantity of seed than usual, and making the ridges as hard as possible by beating them with the flat of the spade. If the lucern after sprouting appear too thick in places, it should be thinned out.

In the Bengal Presidency the seed may be bought from the Government Botanical Garden at Saharunpore. It can also be obtained from Afghanistan, where it is grown extensively.

GREEN WHEAT.

Green wheat is very wholesome food, and may be given in quantities of five sirs daily where horses are not required for hard work. It has a great effect in making the coat glossy and if supplied for several weeks will often produce a total change in a horse which has been thin and hidebound, making him put on flesh and get into healthy condition.

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In some parts of India natives have a strange way of preparing their horses for sale or show. They shut them in a dark close stable, feed largely on green wheat, and keep them without any exercise for four or five weeks. The results are that the horses become loaded with fat, have glossy coats, and are full of spirit, but are of course not fit for hard work.

GREEN BARLEY.

Green barley may be given instead of wheat, and in the same quantities. It would probably have the same effect, but I have had no experience in its use.

BAMBOO LEAVES.

Young bamboo leaves are strongly recommended by native horse-owners as often useful to horses with coughs. In some parts of Assam they are given regularly instead of grass, and seem to answer well.

SALT.

Salt is usually given twice weekly—about an ounce at a time to each horse. I think this is not nearly sufficient, and that at least one ounce should be given daily. To large Walers two ounces would not be too much. It should always be mixed with the food under European supervision, otherwise a considerable portion of it will be stolen by the saices.

For the Government stallions under my charge in the Punjab I made a practice of greatly increasing the ration of salt whenever anthrax or Loodiana fever was in the neighbourhood, giving two chittāks, or about four ounces, daily to each.

I did this in hopes that it might render them less liable than they would otherwise have been to the attacks of the disease, and certainly was fortunate enough never to have had a case amongst them, even when the fever was very prevalent and fatal in the artillery and cavalry at the same station. Of course it is impossible to be certain that their immunity was owing to the salt—but it may have been so—as that substance is very destructive to the lower forms of

freshwater life, and is invigorating to the digestive organs of graminivorous animals.

GRASS-CUTTERS' PONIES.

Before dismissing the subject of food, I will refer for a moment to the feeding of grass-cutters' ponies. Nominally the property of the grass-cutters, they in reality belong to the battery or regimental native banker, to whom nearly or quite all the grass-cutters and saices are in debt. The banker advances money for buying the ponies, and receives a certain sum monthly from the grass-cutters' pay. The grass-cutters are usually quite indifferent to the condition of the ponies, and the latter are generally mere bags of bones unless the commanding-officer insist upon each animal receiving a sir of grain daily.

This ought to be given every morning under the supervision of the stable orderly, or some other European.

CONDITIONING FOR WORK.

In the hot season horses generally have too little work, and fall out of condition to some extent. Their skins too become very tender, so that if sent on a march without preparation at the commencement of the cool weather they are liable to lose flesh, and are very subject to galls. The latter would be far less frequent if the horses were taken out route-marching twice weekly for three or four weeks before starting for their new station. Their skins would be hardened, any slight misfit in the harness would be detected, and their muscles, tendons, and bones brought into condition for real work.

SHOEING.

Roads in India being rarely so gravelly as in England, shoes can be made extremely light. In the batteries to which I was attached the rule was to make shoes as light as possible, provided they did not bend with the weight of the horse. Even these in most stations could be worn for two months, being only removed at the end of the first month.

The shoes of the average-sized riding-horses weighed about eight ounces, and those of the largest Australian wheelers not more than from fifteen to seventeen ounces.

Light shoes, although they may not last absolutely as long as heavy ones, seem to wear less in proportion to their thickness; the reason probably being that the horses do not put down their feet with such violence as when the weight of the shoe is considerably greater.

It is easy to calculate the enormous amount of muscular exertion which is saved in a day's march by a few ounces weight being taken off the end of each limb. Supposing for instance that each shoe is four ounces heavier than it need be, the horse at every pace raises one pound more than is necessary off the ground. If he takes thirty paces in a minute, the weight lifted will be 1,800 pounds every hour. As battery horses usually march at an average rate of about four miles an hour, every one in a march of ten miles will raise more than two tons unnecessarily to a height of some inches from the ground, and this weight not in the most advantageous position—such as on the animal's back—but at the end of the limbs, where the mechanical disadvantage of moving it is great. As only a certain amount of muscular force can be obtained from a certain quantity of food, it is evident that a horse working as above described either exhausts himself unnecessarily or eats more food than would be necessary if he were shod with lighter shoes. Thus the weight of the shoes in a long and hard march may have a marked influence upon the condition of the horses.

Of course, there are some horses with thin, flat soles and low, weak heels, that absolutely require heavy shoes, not to stand wear, but to diminish the concussion between the feet and the roads; still, I am convinced that shoes both in India and England are often made far too heavy for average horses.

NATIVE SHOERING.

The shoes applied to private horses by the native shoeing-smiths, called *nālbands*, are roughly made, and fastened with

clumsy-looking nails; yet they answer their purpose very well if fitted under the eye of anyone who understands the proper way to shoe a horse.

The usual custom is to nail on the shoe considerably within the edge of the toe, and then rasp away the projecting part of the wall until it is even with the shoe. The nails in this case pass too near to the sensitive laminae, and horses, as in England, sometimes go in rather a tender manner for a few days after being shod, until the hoof grows sufficiently to relieve them.

Indian shoes, being always fitted cold, are made of very soft iron, which can be easily hammered narrower or wider in order to adapt them to the shape of the foot. They are so thin that after a few days' work upon rough ground the inner edge of the web is bent upwards, and presses evenly all round upon the sole.

Contrary to what English shoeing-smiths would expect, this does not cause the slightest tenderness, horses so shod galloping over rocks without flinching. In this respect native shoeing is better than that which is practised in England, because when the sole bears a fair share of the weight, the concussion to the wall and strain upon the sensitive laminae must be diminished. I believe that a great deal of the lameness from subacute laminitis, so very prevalent in England, is caused by the custom of bevelling shoes on the foot surface so as to take all pressure off the sole and thus throw the whole weight of the horse upon the wall alone. In India lameness from this cause is very rare amongst native-shod horses.

The practice of bevelling shoes arose from the custom of cutting away the sound parts of the horny soles in order to make them look neat. They were pared until too thin to bear pressure, and then it was thought that they were not intended by nature to bear any.

Although native shoes have no clips, they are not cast more frequently than those of English make, owing to their thinness causing them to conform closely to the arch of the sole. The thinness is advantageous in other respects. It

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allows the frogs, if uninjured by the knife, to rest upon the ground, by which thrushes and contracted heels are prevented. It also enables the smith when fitting the shoe to bend it up at the toe, if required, by a few blows of the hammer. This shape lessens any tendency to trip which may exist, and diminishes the strain on the back tendons.

In India charcoal is used instead of coal for making shoes, both in European and native forges.

All batteries and regiments are allowed native shoeing-smiths to assist the British farriers. In some forges they only take off and nail on shoes, and strike at the anvil. If permitted they can learn both to make and fit shoes in the English style quite as well as Europeans, and they ought to be taught to do so, because in the autumn of almost every year malarious fever is so prevalent that if the European smiths alone can fit shoes the shoeing will often be considerably behindhand owing to the number of men in hospital.

BAZAAR MEDICINES.

The medicines used in regiments and batteries are partly obtained from England and partly from the bazaars. Such substances as nitrate of silver, tartar emetic, nitrous and sulphuric ethers, are supplied from the Government medical depôts; but many of the medicines in everyday use can be bought of fairly good quality in most large bazaars.

The following are the most common bazaar medicines, together with their native names, without knowing which there is sometimes a difficulty in procuring exactly what is wanted :

Acetate of copper, called jangāl, is not very pure, but is sufficiently so for external application. I have found it the best of all remedies when mixed with alum and flour in the treatment of most cases of open joints.

Aloes, called masabbar, is, I think, the Cape variety, which it resembles in appearance, and in strength as a purgative when good, but it cannot always be relied upon. It is therefore better to indent upon the Government Stores for it.

Alum, phitkari, is often impure, but quite good enough for external use.

Camphor, kafur, cannot as a rule be distinguished from that sold in England.

Castor oil, rendi ka tel, varies much in quality. Only the cold-drawn should be used as a purgative. This can be known by being very clear and of a pale yellow colour. The common kind is made by boiling and pressing the seeds. It is of a brown colour, and its strength as a purgative is uncertain.

Chiretta is a perfect substitute for gentian. The dried leaves and stalks are sold in the bazaars. They are about a foot long, as thick as wheat-straws, and of a dark brown colour. When chewed they have a very bitter taste. They can be readily powdered, or made into infusion or tincture. When analyzed they have been found to contain malic acid, resinous matter, bitter extractive, yellow colouring matter, muriate and sulphate of lime and of potash. The tincture is made by putting two ounces of the broken stalks and leaves to sixteen ounces of proof spirit. Let it stand for fourteen days, occasionally shaking it, then filter. Doses are the same as those of tincture of gentian.

An infusion can be made by pouring one pint of boiling water on half an ounce of the leaves and stalks, letting it stand for two hours and straining.

Chiretta was formerly considered to belong to the same natural order of plants as gentian, but botanists are now not all of the same opinion about it. The plant is obtained from Nepal and other parts of the Himalaya Mountains.

Ginger is of excellent quality, fully equal to the best that can be procured in England. Green ginger is called adrak and dry sonth.

Linseed oil, ulsi ka tel, tisi ka tel, is sold like castor oil—of good quality when cold-drawn, and unreliable when otherwise.

Native mustard, rai, is very cheap, but it is difficult or impossible to get the seeds so finely powdered as those of English mustard, which is imported in bottles, and can be

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bought in almost every bazaar. It is better, therefore, to use the latter whenever procurable.

Mylabris cichorii, the blistering beetle, is sold in bazaars, and is usually issued from the Government medical stores instead of cantharides. The insect is found plentifully in India, and is especially fond of settling upon the flowers of the hibiscus. It is above an inch long, by a quarter of an inch wide. The wing-cases are a reddish-yellow, with three broad black transverse bars upon them. The Hindustani name is *telni makki*, which means oily fly, because when seized, small drops of oily fluid are exuded from the joints of its legs. The ointment, as recommended in Tuson's '*Veterinary Pharmacopœia*,' is not strong enough if made with the dried flies. There ought to be one part of the beetle to four parts of whatever fatty matter is used for mixing with it. On the other hand, if experimenting with newly-caught and undried beetles, it is necessary to be very cautious and make it far weaker, for in that state they are much more irritating than when dried. I saw a horse upon whose back a large piece of skin had been completely destroyed by the application of a blister made with some beetles just after they were caught.

For making ointment lard may be bought in many bazaars, but it is not well adapted for India, partly because it is always liquid in the hot weather, and partly because it greatly offends the religious prejudices of many of the natives, especially Mussulmans.

Mutton suet can often be procured, and when purified by boiling and straining answers every purpose. Another excellent substance is a mixture of equal parts of beeswax and the clarified butter, called *ghee*, melted together.

Ghee is made by boiling butter for some time, and skimming off the impurities which rise to the surface. It is then left to cool, and can be kept for many months without turning rancid or showing any other sign of decomposition.

Nitrate of potash, *shora*, is usually impure as sold in the bazaars, and is often of quite a dingy colour. It should be

purified by dissolving in hot water, straining through calico, and leaving it to dry and crystallize.

Nux vomica, kuchla, is sold in the form of the unbroken seed; this is tough and horny, therefore very difficult to powder unless first heated. The better plan is to have it powdered by the natives in the bazaars. As prepared by them, I have always found it so very efficacious in the treatment of paralysis that I never used strychnine while in India.

Opium, āfim, is so frequently adulterated with starch, sugar, pounded leaves, and other impurities, that it should always be procured from the Government stores instead of the bazaars, and should be kept under lock and key, otherwise it is sure to be stolen piecemeal by the native assistants, who are sometimes sent by the farriers to bring articles from the pharmacy.

Sulphate of iron, hira kasis, can be bought sufficiently good for internal use, but very impure samples are frequently supplied if not refused by the veterinary surgeon.

Sulphate of copper, nila tuthia, is usually good.

Sulphur, gandak, answers well for external use; but it is not always pure enough to be given internally with safety, as it sometimes contains arsenic.

Both turpentine, ganda barosa, and oil of turpentine, ganda barosa ka tel, are mostly of good quality.

Vinegar, sirkā, is not nearly so clear and strong as that sold in England, but is good enough for ordinary use in lotion.

Tar sold in bazaars is usually the refuse from the gas factories of large stations.

When Barbadoes or Norwegian tar is wanted, it should be obtained by indent from the Government stores.

European olive oil can be bought in bottles at all large bazaars, but for making liniments, the common sweet oil of India, mithā tel, answers every purpose, and is cheaper. It is expressed from the seeds of *Sessamum Indicum*, called til.

Oil expressed from the seeds of the nim tree, *Azadirachta Indica*, is sold everywhere, and is useful for keeping flies from wounds, but is slightly irritating to the skin.

Another kind of oil, expressed from the seeds of *tārā merā*—a plant closely allied to mustard—is used by natives in the treatment of mange, and is a good remedy, though irritating to the skin, and therefore only fit to be applied over small portions of it at a time. It is on this account less useful than milder kinds of oil mixed with sulphur, which can be rubbed over the whole body without fear.

The above are the medicines most commonly bought at bazaars, but there are many others which are extremely useful and well worth study. I would strongly advise every one in charge of horses in India to buy an excellent little book upon 'Bazaar Medicines,' by Dr. Waring, formerly surgeon in the Indian Army. It is full of important information, and the most reliable work upon the subject that I have ever seen. It is sold by Churchill, of New Burlington Street, London.

There is only one medicine in the use of which the book might mislead, and to which it is therefore important to draw attention.

In describing aconite Dr. Waring only mentions the *Aconitum heterophyllum*, which grows in India, and is called *ātis* in Hindustani. This is not very poisonous, being given in half-dram doses to men with intermittent fever, and is very different in its effects to the *Aconitum napellus* from which Fleming's tincture and that of the British Pharmacopœia are made. It is advisable to obtain this tincture from the Government stores; but when not procurable, an excellent substitute can be made from the root of the *Aconitum ferox*, which is sold in the bazaars. It is fully as strong as the *napellus*, and belongs to the same natural order of plants, the *Ranunculaceæ*. Its Hindustani name is *māhur*, though it is sometimes called *bish* or *bikh*, which merely means poison. It grows in the Himalayas, and is said to be used by the natives in some parts of those mountains for poisoning their arrows.

The root of *māhur* can readily be distinguished from that of *ātis*, by its giving a tingling sensation to the tongue and throat—while the latter is only bitter without any tingling.

DISEASES.

Of the diseases to which horses are subject in India some are peculiar to the country, or at least are unknown in civilized Europe, while the greater number are the same as are met with in England, but modified to some extent by the climate, soil, food and drink.

COLIC.

Perhaps the most common of all diseases, and one from which many horses die annually, is colic. Its chief causes are the following:

1. Grass that is indigestible from being too coarse, or so old that it has become little else than woody fibre.
2. Grass that has been thrown into a heap before it is sufficiently dry, and allowed to remain in that state until fermentation has begun.
3. Bran adulterated with sand.
4. Grass upon the roots of which a large quantity of sandy earth has been left. (Horses as a rule drop roots of this kind after eating the stalks off them, but some which are greedy feeders eat them, and the sand being passed along the intestines with more difficulty than the food, gradually accumulates, and causes irritation. A few horses, owing no doubt to a depraved state of their digestive organs, seem to have a craving for earth, and if they happen to be picketed upon sandy soil, will bring on bad and often fatal attacks of colic by the quantity of sand which they swallow.)

Other causes of colic are :

5. Grain which is musty, or which has been soaked in water so long that it ferments.
6. Giving water to drink shortly after a horse is fed, by which the gastric juice is diluted, and its further secretion is temporarily stopped by the constringing and sedative effects of the cold upon the coats of the stomach.

Lastly, colic is caused by (7) want of sufficient clothing in the cold weather—either from the blankets being ragged or thin, or from the native attendants taking them off the horses

for their own use at night. Colic is therefore more frequent in the cold than the hot weather.

It will be seen that all the above causes are as a rule preventible, except in stations where, under the present arrangements, wholesome grass cannot be obtained in the dry season. If the mounted corps in every garrison had their own tracts of good grass-land set apart by Government, colic ought rarely or never to occur. As a proof of this I may mention that at the Government Stallion Depôt in the Punjab, where there were always from seventy to one hundred and fifty horses and twenty to fifty donkeys, I had the advantage latterly of a very careful Scotch overseer (who was the only European assistant at the stables), and there was not a single case of colic during more than twelve months before I left India, although the animals were in a station where frost and snow were frequent in the winter season. The stable management differed in some respects from that practised with troop-horses. Exercise was given twice daily for fully an hour and a half in the morning and an hour in the evening. Shelter was afforded from cold winds by the thick screens called *jhāmps*. Great care was taken to supply good gram, barley, bran, and grass. In that part of the year when all the grass on the ground was completely dried, the animals were fed upon hay made in the English fashion during the preceding summer. They also received a daily ration of salt throughout the year. To the last practice may, partly at least, be ascribed the fact that there were no cases ever known of horses acquiring the habit of eating earth.

TREATMENT OF COLIC.

Opinions vary greatly as to the best method of treating colic. My own belief is that sedatives or anti-spasmodics should never be trusted to alone, excepting where the attack is simply due to spasm caused by cold.

In the great majority of serious cases, the spasms are brought on by some agent which is irritating to the stomach or intestines, and which ought therefore to be removed as quickly as possible. While, therefore, a sedative may be

given at first to reduce the pain, it should be quickly followed by a purgative. I usually give a dose or two of camphor, and some enemas of warm water. If at the end of an hour the horse is not cured, this is followed by a purgative of aloes or oil.

I have for many years given up the favourite remedy, opium, because, while lulling pain, it stops the action of the intestines and liver, thus delaying the evacuation of the irritant. Camphor does not have the latter effect.

Tincture of aconite, in ten-drop doses, is a very excellent medicine. It allays spasm, and has a tendency, when repeatedly given, to increase the action of the bowels.

RUPTURED STOMACH.

Cases of death from rupture of the stomach or intestines occasionally occur now, but were far more common about fifteen years ago, when it was the universal custom to soak the gram in water for several hours before giving it to the horses.

The general symptoms of rupture are, severe pain, a pulse rapidly increasing in frequency and decreasing in power until almost imperceptible, vomiting of food in small quantities through the nostrils, cold extremities, profuse perspiration, and sometimes sitting upon the haunches, with the body raised on the fore-legs like a dog.

When such symptoms are present, it is scarcely necessary to remark that medicines are useless, and must add to the horse's torture.

BILIOUSNESS.

Biliousness, going on if not checked to bilious fever, is not uncommon in the hot season, especially during breaks in the rains, when the air is very warm and at the same time saturated with watery vapour. It can easily be understood that when the atmosphere is in this state the moisture given off by the lungs and skin is not so readily absorbed as it would be by dry air, and consequently escapes with difficulty. The blood therefore has a tendency to become overloaded

with the various impurities contained in perspiration, and also with carbonaceous materials, owing to a smaller amount of carbon being burnt in respiration by a given quantity of hot air than by the same bulk of cold air.

The liver has thus a great deal of extra work to perform, and at the same time has a diminished power of doing it, owing to its sharing in that languor of the whole system which is produced by moist heat.

Biliousness is more common among Australians and other foreign horses, especially during the first year after their arrival in India, than among country-breds and Arabs.

Want of sufficient exercise, and of green forage, exposure to the vertical rays of the sun, and living in stables in which the air cannot circulate with freedom, all predispose to it.

TREATMENT OF LIVER DISEASE.

The usual symptoms are yellowness of the mucous membranes with slightly quickened pulse and breathing, offensive smell in the dung, which is sometimes coated with thick pieces of mucus and sometimes also of a clay colour instead of the usual yellow. In bad cases there are pains in the liver, shown by the horse putting his muzzle towards his right side, and increased quickness of pulse and breathing. In the earliest stages of the disease, when there are scarcely any symptoms except yellowness of the mucous membranes and offensive smell in the dung, carbonate of soda in half-ounce doses night and morning is a very useful remedy, owing to its increasing the secretion of bile, which is carried off by the kidneys and intestines. At the beginning of an attack, too, before there is much fever, a purgative dose of aloes will often cut it short.

When there is actual fever no remedy is equal to tincture of aconite. If Fleming's tincture, it should be given in ten-drop doses; or if of the *Pharmacopœia*, in half-drachm doses, mixed with a half pint of water, three or four times daily. When there is pain in the liver, mustard-poultices half an inch thick should be placed on the right side, and kept there for thirty or forty minutes until the skin is swollen. The horse should

be kept in a shed away from the reflected glare of the sun, and where the air can circulate with perfect freedom. He should have pure fresh water constantly within reach, and should be fed only upon bran mash and green grass or lucern. If possible give plenty of the latter; but on no account allow grain or linseed.

GLANDERS.

Glanders is stated by some veterinary authors of good repute to be unknown in tropical countries. It exists in a most virulent form in India, and is diffused over districts hundreds of miles apart. I have known it brought to a station by an Australian remount in the days when those animals used to be sent from Calcutta to their regiments directly after disembarkation. The disease is said not to exist in Australia. If this is a fact, the horses must catch it in the neighbourhood of Calcutta, where it is almost invariably present.

Glanders is usually introduced into a regiment now, either by the troopers of native cavalry soldiers, which accompany their owners when on furlough, or else by grass-cutters' ponies. These stroll about loose, while the grass-cutters are collecting their loads, and come in contact with diseased village ponies. It is quite possible also that the latter whilst grazing may infect bunches of grass which are subsequently cut and added to the bundles brought to the cantonments.

HOW SPREAD.

There are many circumstances in India which cause the disease to spread more readily, and which make it more difficult to eradicate than in the British Islands.

1. The natives of India can scarcely be made either to believe in the dangerous character of glanders, or to take ordinary precautions for preventing its spreading. They are therefore liable to carry the virus on their hands or clothes or horse-gear, and unless prevented will allow healthy animals to graze side by side with diseased. They also leave the

carcasses of horses unburied until they are eaten by wild animals.

2. The swarms of flies which exist in most places during the greater part of the year no doubt often carry the virus from one horse to another.

3. Some birds, such as crows, are in the habit of eating carrion, and also of settling on the backs of animals to peck at wounds or to eat insects. It can thus be seen how easily a horse may be inoculated by them if they have previously been feeding upon the carcase of an animal that has died of glanders.

4. Vultures, jackals, and village dogs also feast upon such carcasses, and must necessarily often carry away the infecting matter upon their feet and deposit it on the grass over which they run.

STOPPING GLANDERS.

The following means will be found efficient in eradicating glanders from a regiment or battery :

1. Inspect all the horses and grass-cutters' ponies daily, and if any animal show a symptom in the slightest degree suspicious, picket him at a distance from the lines. If in the fly season, fully half a mile.

2. Pull down the mangers, both that used by the horse and those on either side of him; scrape the pillars and walls clean, dig up the floor to a depth of six inches, cart away all the loose earth to a distance and bury it two or three feet deep, throwing a strong disinfectant over it before covering it. Disinfect all the floor, pillars, walls, and mangers near where the horse stood. (I believe the most certain of all disinfectants in ordinary use to be chlorine. Chloride of lime when fresh, and chloride of zinc, are both very efficient. In closed stables chlorine gas, or sulphurous acid gas, is still more so. When the above cannot be obtained, carbolic acid will answer the purpose fairly.)

3. Take the usual precautions against the possibility of the suspected animal infecting others by means of his food, drinking-water, or stable-gear, and take measures to prevent

his groom from going near the horse-lines. The best plan is to pitch a small tent for him to live in, close by the horse he is looking after.

4. If the latter show decided symptoms of glanders he should, after being shot, be buried fully four feet deep. Before he is covered over his hide should be slashed with a knife, otherwise he may be dug up and skinned by the natives. Some disinfectant should be thrown upon the carcase, and the earth over it rammed hard. It should then be covered with prickly bushes and large pieces of rock. The last precaution is for the purpose of preventing jackals scratching away the soil and eating the flesh.

5. All the stable-gear of the horse should be burnt, and his groom's clothes boiled before he is allowed to return to the stables.

Some years ago, when engaged in stamping out glanders from a Bengal cavalry regiment, in which fifteen troop-horses and seven ponies were destroyed by the disease, two remounts became glandered within seven or eight weeks after they had been handed over to cavalymen whose infected horses had shortly before been shot.

I had adopted the usual measures for preventing the spread of the disease, and could only account for the new animals having become affected by their riders neglecting to obey the orders about boiling their clothes.

If it be found that glanders exists in any of the neighbouring villages, cavalry guards should accompany the grass-cutters and see that they do not go near the infected places. It is quite useless merely to give the grass-cutters orders to avoid them.

BARSĀTI.

Barsāti is a disease peculiar, I believe, to hot parts of the East. Although it has been studied for years past by various veterinary surgeons, its true nature is not yet perfectly known. Mr. Collins, late P.V.S. in India, suggested some time since that the disease seems parasitic. Veterinary-Surgeon Smith, of the 12th Lancers, has asserted that he

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found a special vegetable parasite of an algoid nature, and Mr. Steel, in the *Veterinary Journal* for October, 1881, stated that he had discovered a fungus (actually growing and containing spores) in a piece of diseased matter taken from a barsāti sore.

It has, however, yet to be proved that these fungus-growths are the causes of barsāti. It is quite possible that they are the product of vegetable spores floating in the air and capable of growing in any unprotected wound. I believe that it depends upon some specific germ, either animal or vegetable, and that flies are often, if not always, the agents by which this germ is introduced into the system. My reasons for thinking so are that I have never known a recent wound assume the character of barsāti if effectually shielded from flies. I have seen the disease appear in the unabraded mucous membrane inside the eyelids of colts whose eye-fringes had been lost, but never in those whose fringes were entire and had been kept on. For many years I made it a rule to have every wound or abrasion during the hot season, in horses under my charge, smeared daily with a thick mixture of sulphur and oil, which flies greatly dislike. The disease never appeared in wounds so treated.

Some veterinary surgeons use a mixture of oil and carbolic acid for the same purpose. I have tried it, but found that it does not keep away the flies after a few hours, when the carbolic acid evaporates.

Others apply calico, which is no doubt effectual when it covers a wound closely, but is liable to become loose, or to be displaced.

Barsāti appears as a sore during the hot weather. Its name implies that it comes during the rainy season; but it is often seen several weeks before the rains commence. It has, however, like all wounds or sores, a tendency to become more unhealthy during their continuance, when the air is filled with moisture.

In the sore itself, and under the skin for some little distance around it, are hard white nodules, called kankar, varying from the size of a filbert to that of a pin's point, and often

containing gritty matter composed of crystals, apparently uric acid and phosphate of lime.

About the year 1873 I sent some kankar to the Government chemical examiner at Roorkee, in India; but he failed to discover its nature or composition.

In 1878 I forwarded a considerable quantity in a bottle to Mr. Fleming, who handed it over to the Brown Institution.

Dr. Thin, who examined it, stated that it appeared to be merely composed of masses of cell concretions, but he could detect nothing parasitic about it.

The germs of the disease, whatever they may be, seem to exist in the kankar; for I have found that if every particle of it is entirely eradicated from the sore during the first year after it appears, the wound will heal readily, and the horse will be no more liable to the disease than if he had never been affected.

If the wound be neglected or improperly treated during the first year, the germs are liable to be absorbed and carried to various parts of the body, and the horse may be subject to the disease for the rest of his life. In old cases I have seen lumps of kankar embedded in the substance of the lungs a quarter to half an inch under the surface of the pleuræ. Similar pieces have been found by others in the liver and various parts of the body. They do not appear ever to cause ulceration or even the slightest irritation in the tissues surrounding them when situated internally.

Without any treatment whatever, the sores, if not very large, heal over spontaneously during the cold weather; but when nodules of kankar are left in them, they almost invariably break out afresh every year during the hot season.

When neglected they sometimes spread to a terrible extent, until they form raw surfaces a foot or more in diameter. They do not seem to give much pain or cause an animal to fall away in condition.

Very bad cases of barsāti were common amongst the Government brood mares belonging to the late Bengal studs, when left in charge of the native farmers.

No distinct proof was ever obtained that the disease is hereditary, though some considered it to be so.

I believe that the best method of treatment is to carefully extract with knife and forceps every particle of kankar that can be taken hold of, and then to destroy with caustic all the surface of the sore, because small atoms of kankar, which are too small to be readily seen or seized with a forceps, are usually embedded in the tissues. When the slough comes off, treat the wound with dressings of carbolic acid and oil. Some practitioners recommend eradicating the whole diseased mass with caustic instead of knife. This system seems to me less efficacious, because the caustic, to effect its purpose thoroughly, must be so severe that there is a chance of its destroying some of the healthy tissues under the sore, while it may leave untouched small pieces of kankar some distance within the edges of the skin. With knife and forceps all the kankar except the minutest portions can be extracted readily, and the latter can be reached with ease and certainty without risk of hurting the healthy tissues, and without putting the patient to unnecessary pain. Many internal remedies have been tried, such as preparations of mercury, arsenic, copper, iodine, and iron, but it is doubtful if they are of the slightest use.

When examining horses for soundness in India, the scars of wounds should be carefully inspected. If any hard lumps can be felt under the skin, they are probably pieces of kankar, and the horse should be rejected as unsound.

At some stations unhealthy sores resembling barsāti in some degree appear on the lips of horses early in the hot season. The granulations are of a dark colour, and covered in places with small white particles like kankar, which can be scraped away with the finger. The sores are seldom larger than a shilling, and after attaining that size they rarely increase. Their chief peculiarity is that nothing in the way of treatment seems to affect them. They remain about the same size, neither getting better nor worse, in spite of cauterization, carbolic acid, or any of the usual applications for wounds and ulcers. At the end of a few weeks—perhaps four or five—they rapidly heal, whether treated or left alone.

I never could discover the cause of these sores, and all the suggestions of Inspecting veterinary surgeons and others as to their origin were shown to be wrong by various facts connected with their history. Some attributed them to the horses' mouths being scorched through the bits of the watering-bridles becoming heated by the sun before they were put on. This idea was proved to be incorrect in a battery to which I was attached, by the sores appearing when the bridles were carefully kept in the shade, and also by their healing when no change whatever was made in the usual disposition of the bridles.

There were some trees called *sissu* growing close to the stables, and bursting into bloom at the time when the sores appeared. I thought that possibly the pollen falling from the flowers might prevent accidental abrasions on the lips from healing; but on introducing it into a wound it had no effect whatever.

The following year when I had left the battery, the commanding officer wrote informing me that the sores appeared again at the commencement of the hot season, resisted all treatment as before, and again healed spontaneously at the end of several weeks.

CHIBER.

There is a skin disease which I have never heard of out of India, to which horses are liable if turned on to long grass during the rainy season or at the time when heavy dews are falling. It is called *chiber* by the natives of India, and in its early stage resembles herpes, except that it will not, like that disease, get well without treatment.

Chiber consists of an eruption of small vesicles round the coronets for an inch or more above the hoofs, and sometimes extending into the heels. These vesicles burst, and if not properly treated form a raw surface which may be weeks and months in healing. In some cases this surface becomes, after a time, covered with hairless skin so hard and thick that it resembles frog-horn.

The disease occurs only in horses whose legs are left to get

dry by themselves, when they come from the fields into their stables. If the coronets are rubbed quite dry at once when they are brought in, the eruption is never seen. It might be imagined from this that the disease is of the same nature as cracked heels, or grease; and in many respects it does resemble them. The long dewy grass perpetually brushing against the coronets when the horses walk, would of course wet the front more than the back of the foot; and the evaporation, by producing a reaction, might bring on inflammation in the skin, and other symptoms of grease.

There are, however, some points in which chiber differs from the latter. For instance, there is no swelling in the lower part of the limb. Then, again, horses in England are often brought from wet grass-land into stables without having their legs rubbed dry, yet they never have an eruption on their coronets, although they may in their heels. Another difference is that chiber, so far as I have known it, is only seen where the grass-fields are near swampy land. It did not occur, even during the rainy seasons, in well-drained districts. I am inclined, therefore, to suspect that there is some special irritant floating from the swamps and deposited with the dew, which produces the vesicles by being concentrated as the dew dries from the surface of the skin.

When the disease first appears it may be easily cured in a few days by applying night and morning a lotion composed of chloride of zinc, about half an ounce of Burnett's solution to a pint of water.

In neglected or improperly treated cases where the raw surface is denuded of hair, and is becoming horny in its nature, nothing will cure so well as repeated blisters of hydrarg. biniod. The internal administration of arsenic in five-grain doses for about a fortnight seems to assist the cure in bad or protracted cases.

PRICKLY HEAT.

Horses in India are subject to a skin disease closely resembling, and I believe identical with, prickly heat in man. It commences in the hot season, and the chief

symptom is an eruption of small vesicles which itch intolerably. The part most commonly attacked first is the skin of the neck, from which the disease extends down to the shoulders and often to other parts of the body. If not prevented a horse so affected will rub his mane, tail, and other parts until the skin is denuded of hair, or even actually raw. The disease is not contagious, and the itchiness disappears spontaneously in the cold season of the year.

A great deal may be done to lessen its prevalence by regulating the diet. As soon as the very hot weather commences, the quantity of grain should be diminished and that of bran increased. If barley form part of the ration it should be parched and crushed. Salt should be mixed in the food daily, and green food, such as lucern, given in place of a certain amount of grass, which is often dry and indigestible at that time of the year.

When actually attacked, a horse should be tied so that he cannot rub against anything, and his skin should be dressed twice or three times daily with some kind of lotion to soothe the irritation.

A purgative dose of aloes should be given, followed by nitrate of potash, as a diuretic night and morning. The above remedies mitigate the disease as much as, or more than, any that I am acquainted with. I have tried the internal administration of arsenic, sulphur, mineral acids, and various other medicines, but found little benefit from any.

When the itchiness extends over only a small surface, great relief may be obtained from mercurial ointment, diluted with oil in the proportion of about one ounce to twenty, and well rubbed in; but usually so much of the skin is affected that there would be a risk of the mercury poisoning the horse.

Among the best lotions are the following :

1. Acetic acid 2 ounces
in water 16 ounces, to which it is sometimes useful to add
Plumb. acet. 2 drachms.

2. Hydrocyanic acid (Scheele's strength) $\frac{1}{2}$ ounce.
 Water 12 ounces.
3. Camphor finely powdered . . . 2 drachms.
 Biborate of soda 1 ounce.
 Water 16 ounces.

Kerosene well rubbed in will sometimes apparently cure ; but, so far as I have seen, the itchiness always returns in about a fortnight, except towards the end of the hot season.

Mr. J. Oliphant strongly recommends petroleum mixed with four parts of oil, and states that it cures permanently. I never had an opportunity of trying it, having had no cases to treat during my last three years in India.

THRUSHES.

Thrushes and wounds of feet require much more attention than in England, for unless well protected they are liable to become full of maggots, owing to the swarms of flies which settle on them and lay their eggs.

With proper shoeing thrushes ought to be very rare in such a dry climate as that of most parts of India. By lowering the walls and never allowing any but the ragged parts of the soles and frogs to be removed, the latter will in most horses touch the ground after a few months, when the constant pressure upon them will almost entirely prevent the formation of thrushes.

For keeping away flies from wounds I know of nothing better than a thick mixture of sulphur and oil smeared on daily.

WORM IN THE EYE.

Worm in the eye is common in some parts of the country, and my experience is that those parts are always districts in which there are marshes.

According to Professor Williams, 'There are two kinds of worms found in the eye—the *filaria oculi* and the *strongylus*—both of which are also found in the intestines, the blood-vessels, and the areolar tissue of the loins. In the last situation they are supposed to be sometimes the cause of the

kind of paralysis called kamri. These worms find their way into the horse along with the water he drinks, either fully developed or in the form of ova. Both the parasites and their eggs are abundantly found in the stagnant water of India.'

This last statement of Professor Williams may be quite correct, but I would be glad to know upon whose authority he makes it. A very experienced helminthologist would be required to determine with absolute certainty that worms and eggs in water are exactly the same as those which resemble them in an animal's body.

The only worm that I have seen in the eye is the filaria. It always appears in the cool time of the year, and is thought to be most common after a heavy rainy season. The ova are probably taken in with the drinking-water, and they may also be swallowed with the grass when that is cut in swampy land.

When the worm appears it is about as thick as thread, of a white colour, and from a quarter of an inch to about one inch long. It swims with great activity in the aqueous humour, and sometimes disappears behind the iris for hours.

In a day or two the irritation caused by the worm's movements brings on inflammation of the eye, with opacity of the cornea, and after a short time the horse usually becomes permanently blind unless relieved.

The whiteness of the cornea occasionally comes on so suddenly that it is the first symptom which directs attention to the state of the eye.

Now and then a case occurs in which the worm dies before the eye is much injured, when it decomposes and is absorbed, the opacity gradually disappearing and the sight being saved. This, however, is so rarely the result that the worm should always be let out by puncturing the cornea as early as possible. The sooner the operation is performed the more likely is the sight to be saved. When properly managed the anterior chamber refills quickly with aqueous humour, the inflammation subsides, and in the great majority of cases no

trace of the puncture remains, except a small white spot or line where the lancet has entered.

I have always made the wound at the lower and posterior part of the cornea, in order that the objects in front of the horse might be seen without their distinctness being in any way interfered with by the scar. I never cast the horse, but merely let my fingers rest upon the cheek with the point of a small narrow lancet close to the eye until the animal left off winking, and then, choosing a moment when the worm was in the lower part of the chamber, made the puncture so rapidly that there was no time for the patient to move his eye or head.

When done in this way the aqueous humour gushes over the hand and almost invariably brings the worm with it. In my own practice it has failed to do so in only one instance, when the parasite was so large that not more than half his body came out of the aperture, and before I could seize it he drew himself back into the anterior chamber. By the following morning he had crawled out, and was found still alive inside the eyelid, but his movements had so injured the iris that the sight was permanently destroyed.

After the operation a wet rag should be kept hanging over the eye to keep it cool and shield it from the light, until the inflammation has disappeared.

General Sir Frederick Fitzwygram, in his book on 'Horses and Stables,' recommends the puncture to be made at the upper and inner part of the cornea. The upper part is undoubtedly a better situation than the lower, because no scar can be left in the line of vision when the horse is observing objects on or near the ground. It is also better because there is less likelihood of the rapid healing of the wound being hindered by the aqueous humour trickling through it. It would be necessary to cast a horse for this operation, and have his eyelids held well apart before puncturing.

Wherever the incision is made, care should be taken to let the lancet enter obliquely, and in a direction almost parallel to the iris. There will then be no chance of wound-

ing the latter, and the outer lip of the wound will overlap the inner, an arrangement which will assist it in closing and healing rapidly.

If the operator be doubtful of the steadiness of his hand it is a safe plan to wind a piece of cotton round the lancet, leaving about a quarter of an inch from the point free.

KAMRI.

Many people believe that the kind of paralysis called kamri is often of a parasitic origin, and associated with worm in the eye. I have never seen any decided evidence of this, having only met with one instance in which a horse who had worms, in his case in both eyes, was also paralyzed.

It is, however, quite conceivable that the ova of these parasites might be carried along the bloodvessels into the brain or spinal cord and there hatched, when the irritation would cause paralysis.

Kamri is certainly most common in districts which are swampy or subjected to inundations during the rainy season, and this fact increases the probability of its parasitic origin. I read an account by one veterinary surgeon, whose name I cannot now remember, in which he asserted that he had actually found filaria in the brain.

The word 'kamri' merely means 'belonging to the loins.' In some parts of India it is called a stroke of the wind, from the belief that it is caused either by a chill or by something injurious in the wind when coming from one particular direction.

Mr. Hallen, Inspecting Veterinary Surgeon of the Bombay Army, has stated that in one instance he stopped its recurrence in a native cavalry regiment, where it had been prevalent, by building a wall high enough to shelter the horses from wind.

The disease was very common amongst the Government brood mares at Buxar, where one of the late Bengal studs was situated, when I was in veterinary charge of it ten years ago. The country all round was inundated to a considerable extent during the months of July and August, the land

gradually drying in September and October. The mares were kept by native farmers who were bad horse-masters, and frequently fed them upon coarse indigestible kinds of grass cut from the beds of swamps.

The disease usually came on very gradually, the first symptom noticed being a loss of control over one hind-leg when the mare was turning round after being trotted out at the monthly inspection. In two, three, or four months afterwards the animal was generally incapable of walking without the hind-quarters staggering to one side or the other.

Sometimes a horse will remain only slightly affected for months or years, being even capable of slow harness-work; but usually it is advisable to destroy him within three or four months at the furthest, after the appearance of the first symptoms. Treatment is useless in the majority of cases. The most common remedies, after giving a purgative, are blistering or firing over the loins or along the course of the spine, and the internal administration of strychnine, iodine, sulphate of iron, chiretta, and remedies of that kind. The compounds of iron might be useful in cases where the disease is of parasitic origin—iron being poisonous to many of the lower forms of animal life. Freshly ground *nux vomica* in doses of about half a drachm has always appeared to me to produce a better effect than strychnine. Blistering the loins repeatedly seems beneficial in many instances; and when the patient rises with difficulty it is a good practice to put him in slings of such a length that he can rest in them or stand, as he pleases. The administration of iodide of potassium in alternation with sulphate of iron has been followed by good results in my practice, the iodine being given with a view of promoting the absorption of any effused fluid which might be pressing upon the spine or spinal nerves.

The diet should be laxative and yet nutritious, consisting of linseed boiled to a jelly and mixed with dry bran, fresh green grass grown on well-drained land, green lucern, or green wheat. Grain should be given only sparingly. If oats, they should be crushed; and if barley, it should be both parched and crushed. Gram is not good in this disease,

being rather difficult of digestion by a horse which is unable to take exercise. Fully one ounce of salt should be mixed in the food daily, and even double that quantity to a large horse.

ANTHRAX.

Anthrax fever is one of the most fatal diseases to which horses in India are subject. It is usually called Loodiana fever, because it was first brought into prominent notice by a very severe outbreak having occurred some years ago at Loodiana in the Punjab. It sometimes appears in isolated cases. For instance, one horse only in a whole regiment may be attacked on the line of march at a camping-ground. Usually, however, many horses are affected within a few days when there was previously no reason whatever to expect an outbreak of the disease.

On its first appearance it is generally very virulent, by far the greater number of those attacked dying; but at the end of the outbreak it becomes milder in its character, allowing a larger proportion to recover. This fact, which is observed also in cholera and other epizootics, is very apt to mislead practitioners with regard to the action of various remedial agents. Having in the early part of an outbreak failed to cure, they try new plans of treatment, and at last, finding themselves successful in a large proportion of cases, they attribute the recoveries to the action of the new remedies.

Some years ago, during my residence in India, a surgeon tried tartar emetic in the treatment of cholera with such success that many thought the specific for that disease had at last been found.

During an epidemic of cholera in the West Indies, a surgeon treated the last seventeen cases with iced sea-water, and they all recovered.

Neither tartar emetic nor iced sea-water seem to be much used now, and the proportion of deaths in those attacked by cholera appears to be as great as it was sixty years ago.

A salūtri in the Bengal cavalry, in his evidence before a committee some years since, asserted that he could cure

Loodiana fever, and, doubtless, many cases of what English officers believed to be that disease had recovered under his treatment. When it appeared at Rawul Pindi in 1878, the general commanding the garrison sent for him without delay. He arrived about two days after the horses were first attacked, and was found to be as powerless in curing it as other practitioners.

Causes.—The cause of Loodiana fever is evidently some kind of blood-poison associated with, or perhaps identical with, the bacteria of anthrax. In 1878 I sent Mr. Fleming, I.V.S., some blood of a horse which died with the disease at Rawul Pindi. It was examined by Professor Duguid, and found to contain great quantities of the anthrax bacilli. A guinea-pig inoculated with this blood died in two days, and the local exudation under its skin, as well as the spleen and the blood generally, were discovered to be swarming with bacilli of the same kind.

Symptoms.—The first sign of Loodiana disease in horses is sometimes only a slight dulness, soon and invariably followed by fever.

The symptoms succeeding this are various, depending probably either upon one part of the patient's system being weaker than the rest, or upon more of the poison accumulating in one part than another.

In some cases the brain is chiefly affected, when there is drowsiness, followed by speedy death.

In other instances the brain is not affected primarily, but becomes congested by the pressure of lymph, effused in the neck, impeding the flow of blood from the head.

In other cases the disease is concentrated in the digestive organs more than in other parts, producing symptoms of colic or enteritis.

In the great majority of horses attacked, a swelling appears round the throat, at a longer or shorter period after the first signs of fever. This swelling increases in size, and extends down the lower side of the neck towards the chest, filling up the hollow between the trachea and muscles where the carotid artery and jugular vein lie. There is a discharge from the

nostrils, usually at first like that in catarrhal fever, but afterwards of a lymph-like character, and sometimes tinged with the red colouring matter of the blood. Petechiæ are seen on the Schneiderian membrane, the breathing is quick, the pulse ranges from 60 to 70, and the temperature of the rectum frequently reaches 106°.

At the latter end of an outbreak some cases may be so mild that, if anthrax were not in the station, they might readily be mistaken for slight attacks of catarrhal fever.

I have seen several horses in a regiment seized at the same time with symptoms of that disease, the breathing being quick, but not excessively so, the pulse 60 or 70, the visible mucous membranes rather red, with a moderate discharge of mucus from the nostrils. There would be no reason to suspect danger, except from the high temperature, viz., 104° to 106°.

Treated with the common remedies for catarrhal fever, such as salines and diffusible stimulants, some of these horses have recovered in four or five days; while the others, treated with the very same medicines, have at the end of the third or fourth day begun to swell round the throat, and have died within twenty-four to forty-eight hours afterwards.

On making a post-mortem examination, the usual well-known appearances of anthrax have been found.

Duration of Disease.—The duration of the disease varies from about two hours to five or six days. Its progress is sometimes so rapid that a horse, apparently in good health at mid-day feed, will be dead in two hours afterwards; but even at the beginning of an outbreak the majority of horses will be sick from six to ten or fifteen hours before dying.

Causes of Death.—The immediate causes of death are various.

1. Paralysis of the whole nervous system, from the blood being deficient in vitality, or perhaps from the bacteria mechanically impeding its flow through the capillaries, such paralysis gradually stopping the action of the respiratory and circulatory organs.

2. Apoplexy, produced by the impediment to the flow of

blood from the head, through the lymph which is infiltrated in the neck pressing upon the jugular veins.

3. Indirect suffocation, from lymph infiltrated into the intra-lobular tissue of the lungs, impeding the flow of blood through the air-cells.

4. Direct suffocation, from the excessive accumulation of lymph in the areolar tissue around the throat closing the aperture of the larynx.

The most common cause of death is the last-mentioned. This is shown by the fact that, in a majority of cases, the bronchial tubes are filled with frothy mucus as they are after death from drowning, and also that the noise produced by the impediment to breathing can be distinctly heard coming from the throat.

Post-mortem Appearances.—The post-mortem appearances vary in some degree, though there is one common characteristic, viz., the effusion of lymph, looking like yellow jelly, into the areolar tissue, accompanied with dull red patches of all sizes on the surfaces of the mucous and serous membranes, produced by aggregations of red corpuscles or of their colouring matter. The blood, too, is dark, and has little or no tendency to coagulate.

When the brain has been chiefly affected there will be found some congestion, with effusion of lymph into the ventricles and petechiæ in the membranes.

When the disease has been concentrated to a considerable extent on the digestive organs, there is effusion of lymph into the connective tissue of the omentum and other parts, into the walls of the intestines and under the epithelium of the serous membranes; parts of the stomach or intestines are stained a dull red colour, and the spleen is gorged with very black blood of the consistency of treacle.

In those cases where the respiratory organs have been chiefly affected, there will be found effusion of lymph into the areolar tissue round the throat, down the under part of the neck to the chest, and in the spaces between the larynx, jugular veins, carotid arteries and muscles of the neck. Here and there portions of muscle or connective tissue or

membrane will be stained a dull red by the colouring matter of the blood, and such stains are not unfrequently found on the serous membrane or in the muscular portion of the heart. The serous surfaces of the lungs will probably be coated with a thin layer of lymph, the substance of the lungs will be more or less congested, and the bronchial tubes frequently filled with frothy mucus.

In these cases there is usually also some infiltration of lymph in the abdominal cavity, together with dark red spots on the mucous and serous surfaces of the abdomen.

Treatment.—The treatment of anthrax fever has hitherto been very unsatisfactory in its results. Remedies of the most opposite characters have been tried, but under every kind of treatment the mortality has been very great.

In many cases, death or prostration of the vital powers comes on so suddenly that no medicines have time to affect the system. Greater success has followed the administration of carbolic acid than of any remedy hitherto tried.

This medicine was recommended by Mr. Fleming for anthrax long before Loodiana fever was known to be a disease of that nature, and it was given to five horses by the advice of Mr. F. Collins, late P.V.S. in India, during the outbreak of the fever at Rawul Pindi in 1878. The doses were half a drachm in six ounces of water three times daily. As only one of the five horses died there was reason to hope that a very efficient remedy had been found; but it is stated that an equal success has not resulted from the same treatment on subsequent occasions in other places. The horses treated so successfully at Rawul Pindi were among those attacked some days after the first appearance of the disease, when its virulence had begun to abate; but even allowing for this, a far larger proportion of recoveries has followed the use of carbolic acid than of any other remedy.

The acid in its pure form is dissolved with difficulty in water, and only small quantities can be introduced into the system without producing poisonous effects. It can be much more readily dissolved in water if previously mixed in a mortar with four parts its bulk of glycerine.

SODIUM SULPHO-CARBOLATE.

It would be well worth while, in future outbreaks of anthrax fever, to try the result of administering the acid in the form of sodium sulpho-carbolate, as suggested by Dr. Lionel Beale. He states that Dr. Sansom carried on some experiments with it a few years ago, and found that, in this form, an amount of the acid could safely be taken into the system which would be highly poisonous in its free state. Whether it would have as great an effect, as in the latter form, in checking the progress of anthrax has yet to be seen, but there is great reason to hope so.

When given to man in doses of from twenty to sixty grains every four hours, the odour of carbolic acid was readily detected in the breath, and the urine contained a considerable quantity of sodium sulphate, but no acid. Evidently, therefore, the salt was decomposed in the blood or tissues.

The dose for a horse would be about three drachms every three or four hours at first, and at longer intervals if the patient improved.

COMMON SALT.

When in private practice, before entering the army, I found large doses of common salt very successful in treating a disease in horned cattle exactly resembling Loodiana fever, and therefore during the prevalence of anthrax, at Rawul Pindi. I advised Veterinary Surgeon Burton, who was then in charge of the Royal Artillery horses, to try the effect of salt upon one horse which was very dangerously ill. He did so, and the animal rapidly recovered; but like those treated with carbolic acid, he had been attacked when the first virulence of the epizootic had subsided, so possibly he might have survived without any medicine. This, so far as I am aware, is the only instance in which common salt has been given in the disease, but it might be worth further trial. The doses I would recommend are one pound at once, in two or three quarts of water, and four ounces every four hours afterwards, gradually increasing the intervals if the patient improved.

While treating the sick horses, great care should be taken to remove frequently, and bury deeply, after mixing with disinfectants, any part of the flooring upon which the discharge from their nostrils has been dropping. It would be better still to burn it, where fuel can be obtained. Inspecting Veterinary Surgeon Evans states that he has found the bacilli of anthrax in these discharges, and there is considerable reason to suspect that they may communicate the disease to other horses.

Plenty of disinfectants should be constantly used about the hospital, and all the usual precautions should be taken with respect to mangers, buckets, head-collars, and other gear, as well as the stable-flooring.

The disinfectant most easily obtained in Indian garrisons is Dougal's powder, which contains carbolic acid. It is very excellent, but perhaps not quite the best. Now and then the chloride either of zinc or lime can be procured, and there is good reason for believing them to be superior to most other available substances for the destruction of disease germs. In Braithwait's '*Retrospect of Medicine*' for June, 1880, there is an account of a detailed and microscopic examination by Surgeon-Major J. Lane Notter, A.M.D., of the effects of various disinfectants and deodorizers upon some putrefied beef infusion, swarming with bacteria. Dr. Notten found that chloride of lime destroyed both the putrefactive odour and the bacteria themselves, no free bacteria being visible.

Burnett's solution of chloride of zinc destroyed the bacteria, but a slight odour of putrefaction remained.

Carbolic acid subdued the odour, while the activity of the free bacteria was persistent, though lessened.

There is strong evidence for believing that the poison which produces anthrax is developed in stagnant water. In almost or quite every outbreak which I have seen or heard of, there was either actual proof or good reason to believe that the horses had been fed upon grass cut in or near swamps, or that they had been supplied with water from very impure sources, such as tanks where it was stagnant, and abounding in decomposing organic matter.

PREDISPOSING AND EXCITING CAUSES.

In a majority of instances the ground upon which the horses were standing was of a porous nature, allowing the urine to soak into it and give off the effluvia resulting from decomposition. In other instances, the drinking water, when not from tanks, was from impure wells, and carried sometimes along pipes underneath roads where the downward curve of the pipe was found to be half filled with putrid mud.

No doubt horses may be—and often are—subjected to all the above-mentioned deleterious influences without becoming affected with anthrax; but it is certain that exposure to such influences greatly predisposes them to become affected whenever they come in contact with the disease-germs.

We see human beings live in fair health for years, while eating unwholesome food, drinking impure water, or breathing air filled with emanations from animal excreta; but when subjected to the influence of the germs of various epizootic diseases, it is well known that those who have been living in, such a state fall sick in far greater proportions than those who have lived upon pure air, food, and water.

HOW TO STOP ITS SPREAD.

When anthrax appears in a regiment or battery, the following steps should at once be taken to prevent its spread:

1. Picket all the horses upon ground at least a hundred yards from the stables, and remove them to a new spot every two or three days, or whenever a new case of disease occurs. When suitable ground can be procured within a convenient distance, it is well to take them in the first instance completely away from the garrison. (By the above measures the horses will be prevented from breathing the emanations of decomposing urine arising from the ground in which they have been stabled, and will run little risk of inhaling the disease-germs given off by the animals attacked, or which may be in their mucous discharges or excreta.)

2. Change the drinking-water if there is the slightest reason to suspect its purity.

3. Ascertain the source whence the grass is obtained, and take measures to ensure its being cut upon well-drained land. (During the hot season, when most of the grass in a district is burnt to the ground, the grass-cutters are very apt to cut from dried swamps, or the bottoms of dried tanks.)

4. Increase the ration of salt, giving to each horse one chittāk, or two ounces, night and morning for three or four days, and afterwards that amount once daily, until the disease has disappeared from the station.

The period of incubation of the fever is usually only five days in the Bengal Presidency; so that if no fresh cases occur after that time, it is generally safe to conclude that the spread of the disease has ceased.

It should be remembered, above all things, that a horse with anthrax is much more dangerous when dead than when alive. M. Pasteur, who has been engaged for many years past in investigating the nature of disease-germs, has recently proved, by actual experiment, that the spores of charbon, a kind of anthrax, may be brought to the surface of the ground in the casts of earth-worms after having been buried for two years, and that they still retain their vitality. He took some worms from the ground immediately over a spot where the carcass of an animal which died from anthrax had been buried, and inoculated a guinea-pig with some of the contents of their intestinal canals. The guinea-pig very quickly died, with all the symptoms of charbon.

It can therefore be readily seen how necessary it is to bury the carcasses of horses which die of anthrax as deeply as possible; certainly not less than five or six feet, and ten would be better.

Before covering them over, the hides should be slashed in various places, so that natives may not dig up and skin them. They should then be thickly sprinkled with Dougal's powder, chloride of zinc or of lime, or with common salt, both for disinfecting purposes and in order to prevent worms working near them.

The earth with which the graves are filled should be well rammed and covered with pieces of rock and prickly

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bushes. This will prevent jackals burrowing down to the carcasses.

The stable-gear into which it is possible that the discharges of the sick animals may have soaked should be buried with them, or burnt.

All this must be done under the supervision of trustworthy Europeans, as natives cannot be depended upon to do it properly.

Burning the carcasses would be far preferable to burying them ; but fuel is in most places too scarce to allow of this.

Before the surviving horses return to their stables all the flooring should be renewed, and other precautions against infection should be taken, as recommended after an attack of glanders.

At the latter end of 1880, Dr. Evans, Inspecting Veterinary Surgeon, was sent by the Indian Government to Assam for the purpose of investigating the nature of a very fatal disease amongst the horses, or rather ponies, of that part of India.

It proved to be anthrax fever, and Mr. Evans's observations throw considerable light upon the subject. He found that—

1. There was some reason to believe that the period of incubation might be quite seven days, although it is not known to have been more than five in Bengal.

2. That ponies in Assam running loose and unstabled on the tops of hillocks, and fed, so far as can be ascertained, upon grass grown on dry ground, or even upon bamboo-leaves instead of grass, catch the disease almost as readily as those upon the swampy level land below the hillocks.

3. That although, in large numbers of cases, ponies caught the disease from drinking stagnant water, yet they were capable of catching it when the water was apparently pure.

4. That the conditions most favourable to the spread of anthrax are a large extent of swampy ground gradually dried by exposure to the sun. The germs of the disease could readily be carried in the air from such ground to the ponies living upon hillocks above it. Dr. Evans calls attention to the fact that experiments have shown that the germs of anthrax pass into the animal system more readily by the

lungs than by the alimentary canal, except in cases where there is an abrasion upon any part of the mucous membrane of that canal, including, of course, the lips.

He is evidently inclined to believe that the germs raised by evaporation from the swamps may be carried by the wind over miles of country, and then be taken into the animals' systems, either by entering their lungs, by falling into the water which they drink, or by settling upon the food which they eat.

He clearly shows another most important fact, viz., that although very insalubrious conditions of life may favour an attack of the disease, they do not produce it unless the germs of anthrax happen to be present.

In the district of Sylhet, which is the valley of the Barak river, most of the soil is blue clay, and therefore very retentive of moisture. During the rainy season the greater part of the valley is under water for many weeks, and in some places for months. As the floods fall, enormous tracts are converted into swamps which are gradually dried by a tropical sun. The ponies of the natives live in very dirty stables, and in the town of Sylhet are fed upon long dhub grass, cut from the dry clay beds of the swamps. They are watered, some from the river itself, but many from small filthy pools surrounded by bamboos and trees, the leaves of which drop into the water and there decompose.

In these pools, too, the natives daily wash themselves and their clothes.

In addition to living as here described, the ponies are frequently turned out to graze in the swamps, where they must not only breathe the emanations from the stagnant water, but drink the water itself. In spite of all this, anthrax fever is unknown in any part of the Sylhet district. As it is common in the adjoining districts, it seems reasonable to conclude that the exemption is due solely to the fact that the germs have never been imported.

INOCULATION.

Mr. Evans refers, at the end of his report, to the recent researches in Europe, which show that animals may be protected from anthrax by inoculation with virus which has been modified by cultivation under peculiar conditions.

Inoculation, it seems to me, is the only means by which there is any probability of the disease being entirely eradicated from Government stables in India.

SUBSTANCE OF ADDRESS OF M. PASTEUR.

In the *Veterinary Journal* for September, 1881, there is an editorial article upon the subject of inoculation, and a report of the address of M. Pasteur at the International Medical Congress, in London. It is well worth careful study.

M. Pasteur states that the virus of chicken cholera, or of splenic fever (both being forms of anthrax), may be cultivated in chicken broth for ever, and retain its full destructive qualities, provided that the germs be protected from the air; but if exposed to it at a certain temperature they gradually lose their fatal powers through the action of oxygen. The longer they are exposed the less virulent they become, until at last, though they continue to reproduce themselves, they do not cause death when introduced into the systems of animals. Yet they cause their respective diseases in a mild form, and animals so affected are protected for a long period, perhaps for ever, from the influence of the most virulent germs. In other words, they are not susceptible to anthrax any more than a vaccinated man is susceptible to small-pox.

It is earnestly to be hoped that veterinary surgeons in India will in future take the opportunities afforded by outbreaks of Loodiana fever, to make experiments like those of M. Pasteur. It is very probable that the virus may be capable of the same alteration as that of chicken cholera and splenic fever, if cultivated in a similar manner.

HORSE SICKNESS OF SOUTH AFRICA.

There is now no doubt whatever but that the disease in South Africa called horse-sickness is a form of anthrax, closely resembling, if not identical with, Loodiana fever.

Amongst other descriptions of it is one in the *Veterinary Journal* for August, 1881, by a Mr. Hutcheon, V.S., in the Cape Colony. The post-mortem appearances of a horse which he opened were exactly like those frequently found in India in cases of anthrax. He also discovered great quantities of bacteria rods in the blood.

INSPECTING VETERINARY-SURGEON EVANS'S REPORT UPON SURRA.

In the *Veterinary Journals* between July, 1881, and the present time, there have frequently been extracts from a copy of a report by Inspecting Veterinary Surgeon Evans upon a disease called Surra, which he was sent to investigate in the district of Dera Ismail Khan, on the western side of the river Indus.

In 1879 I was at the town of Dera Ismail Khan, acting as judge at a horse show, when the Punjab Government wrote requesting me to examine some horses of a native cavalry regiment there, which had been attacked with Surra, to ascertain if I could suggest any cure or any way of preventing it.

There were then four or five horses ill with it, but as business prevented my remaining in the station I was unable to make a proper inquiry into its nature.

The only prominent symptoms then observable were debility, emaciation, and extreme pallor of the visible mucous membranes.

So far as I could discover, all the horses attacked had been living in the neighbourhood of rivers which had overflowed their banks.

I reported to the Punjab Government that the disease was probably caused by some blood-poison carried into the

system, by the horses being fed upon grass that had grown in marshes or on the swampy banks of streams, and recommended that great care should be taken to have the grass cut from well-drained land, that salt should be given with the food, and that the sick horses should be treated with iron and vegetable tonics, combined with diffusible stimulants.

About twelve months afterwards Dr. Evans was sent by Government to make a thorough investigation of the disease. His report is well worth reading in full, but I will here give only the substance of it.

Symptoms of Surra.—The chief symptoms observed at first are capricious appetite, staring coat, great languor, and tendency to stumble. If the animal be kept at work symptoms of considerable fever come on, shown by quick pulse, hot mouth, and increased temperature; but these subside after a few days' rest. There are often slight catarrhal signs with discharge of yellow-tinged mucus from the nostrils, and of tears from the eyes.

In a few cases the submaxillary glands are swollen and tender, and in a large proportion of the patients there are dropsical swellings under the chest and in the sheath, which in some instances subside, and in others increase. Occasionally the swollen glands suppurate and burst, a thick gluey discharge at the same time running from the nostrils.

The most distinctive symptom is that the membranes of the conjunctiva and vulva are yellow, with claret-coloured spots on them. When the salūtri (or native doctor) sees those, he is sure that the disease is really Surra.

The appetite remains good to the last, yet the visible mucous membranes become blanched, and the horses gradually waste away until they die from exhaustion. No case has ever been known to recover. A few linger for more than a year, but the majority die in about two months.

Post-mortem Examination.—Post-mortem examination reveals no structural changes in any of the internal organs. There is effusion of clear serum in the abdomen, with a layer of lymph upon the peritoneum. In several instances filaria

papillosa and other nematodæ were found in the mesentery, and in some the mucous membrane of the intestines was yellow, and marked with petechiæ.

Possibly caused by Flies.—There is no evidence that the disease is contagious or infectious in the ordinary acceptation of those terms. The natives believe that it is caused by a large fly about the size of an English gadfly, which is common in the country, and which bites the legs of horses until the blood flows down them in streams. Dr. Evans thought that possibly these flies might convey the poison by biting one horse before the blood which they had extracted from another had dried upon their mouths.

Animals Subject.—Mules and camels are subject to the disease, but horned cattle and donkeys are said to be exempt.

From a series of experiments, Dr. Evans found that a healthy horse becomes affected if the blood from a diseased one be either swallowed or injected under the skin.

Inoculation.—When inoculated in the latter manner the first external signs of the disease appear on the fourth day, and on the sixth the blood is swarming with parasites of a peculiar kind. When the blood was given to drink, the first signs of illness were seen on the fifth day, and the parasites on the seventh.

These parasites are apparently round, tapering in front to a neck, ending in a blunt head. They are white in colour, with active eel-like motions, and seem to be about three or four times the diameter of a white corpuscle in length and one-tenth the diameter in breadth. They appear to live upon the red corpuscles.

CHANGES IN THE BLOOD.

In the early stages of sickness, the blood firstly has a greatly increased proportion of white corpuscles; secondly, a large number of the red corpuscles changed into shapeless particles of pale red jelly; and thirdly, a large quantity of small granular particles floating in the serum.

Mr. Evans believes that the parasite is derived from the

stagnant water which the horses drink, but thinks that it exists there in a different form, for none could be found in the water of the same shape as those in the blood, and when some of the latter containing the living parasites was mixed with well-water, the animals died and were decomposed, after which, injection of the water under the skin, and giving it to drink, equally failed to produce the disease in healthy horses.

DOG INOCULATED.

When the blood of a diseased horse was injected under the skin of a dog, the latter became very ill, and his blood was found swarming with the parasites, but he afterwards recovered.

CAUSES OF DISEASE.

The disease usually commences as an epizootic in August, and continues until January, when it suddenly ceases.

Carbolic acid administered internally had no good effects upon the sick horses, and Dr. Evans suggests no cure. He thinks the only means likely to prevent the disease is, either to boil the water, or ensure its being obtained from a pure source ; but he appears to be not quite certain that the water is the cause, though he found that in almost every place where horses were affected it was stagnant and impure.

HYDROCELE.

Very bad cases of hydrocele are sometimes seen in India, the quantity of fluid in the scrotum increasing in the hot season and diminishing in the cold. Now and then the scrotum becomes so distended as to impede a horse's movements.

When a disease of this kind has lasted for some time, the abdominal rings are liable to be so relaxed that the intestine can easily slip through as soon as the fluid is removed. If, therefore, it be thought necessary to castrate a horse affected with chronic hydrocele, the safest way of doing so is by the covered operation, wooden clams being applied without caustic, in

order that there may be no impediment to the union of the internal wound by the adhesive process.

If the uncovered operation be performed, there will be great danger of its being followed by hernia.

BAGGAGE ANIMALS.

The animals used in India for baggage purposes when troops are marching, are elephants, camels, oxen, ponies and mules.

CAMELS.

Camels vary very much in their muscular strength and other qualities. When large and powerful one of them can carry for a day or two as much as eight maunds, or about 650 pounds; but on a march an average camel should never be loaded with more than four maunds, otherwise he will fall away in condition, and become liable to sore back. When loaded the usual rate of travel is about two and a half miles an hour.

The camels of the lower parts of the Bengal Presidency are almost useless upon ordinary roads in wet weather, owing to their inability to walk with safety upon slippery ground. Their legs sometimes slide apart to such a degree that the muscles which attach them to the body become torn, and they die from internal bleeding, or at least are incapable of walking, and have to be left behind.

The camels of the Punjab are much more sure-footed, and if moderately loaded, will travel in very rainy weather over slippery clay soil quite as well as horses.

It is often stated that camels are incapable of climbing steep hills; but this is not true of those accustomed to mountainous districts, as they will climb rocks easily, and go almost anywhere, provided the path is free from grass or leaves, and wide enough for their feet.

While superintending the horse-breeding of the Punjab, I regularly employed from sixteen to eighteen camels for about seven months in each year. During the three years I was

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at that work the only casualties I can remember were, one camel having a sore back, one dying, completely worn out, at about the age of thirty, and one becoming useless from an accident.

MANAGEMENT ON MARCH OF CAMELS.

The only precautions as to their management that I ever took were, to engage them with their *old* saddles, to load them moderately, and to let them start at such an hour that they could finish their day's march early enough to go into the jungle and have a full feed before dark.

AGES OF CAMELS.

A camel is not full-grown until quite eight years of age, by which time he has the full complement of eight incisor teeth and four canines, two in each jaw. At six years there are four incisors, and at seven years six. He will work up to the age of twenty-five or thirty.

SELECTING CAMELS.

When selecting camels for work a most important point is to see that the elbows are not close to the ribs. If they are, they will be sure to gall the sides when the animal is walking with a load. Hind-legs very much bent, like those of sickle-hocked horses, are also disadvantageous for carrying heavy weights. Each animal should be made to kneel in order that his back may be examined to find whether it has been badly galled, the owners often being careless upon this point. One with the hump much wasted away should not be taken, for it shows either that the animal is old, or has been starved, or is exhausted by hard work or disease. Short-legged camels of moderate size are the best for long-continued hard work.

DISEASES OF CAMELS.

Many of the diseases of camels are extremely puzzling to veterinary surgeons. It is often difficult to see by any

symptoms that an animal is very ill, although he may die within a few hours afterwards. Owing probably to the want of sensibility in their nervous system, they do not as a rule show outward signs of internal disorders to nearly the same extent as horses or horned cattle. When a veterinary surgeon does not see clearly the proper way to treat a sick camel, which will often be the case, judging by my own experience, his safest course is either to leave him alone or to allow the natives to treat him in their own way, which is often effectual, although apparently brutal.

Camels are liable to mange, lung disease, diarrhoea, dysentery, colic, anthrax, and fits, which are said to be produced by exposure to a very hot sun.

The symptoms of the last-mentioned disease are walking in circles, falling down, convulsive movements of the limbs, and insensibility, lasting for five or ten minutes. It is very fatal. In treating the disease the animal should be sheltered from the sun and have a brisk purgative, consisting of three to four drachms of croton-seed, followed by about half an ounce of nitrate of potash night and morning. Of course cold wet cloths should be applied to the head, and such measures taken as would be advisable in treating the same disease in other animals.

For colic, give two quarts of ghi or sweet oil, or rather more than one quart of castor oil.

In cases of dysentery, commence the treatment with an oily purgative, and afterwards give one drachm of opium and ten grains of calomel, mixed with a quart of jelly made with boiled rice, three times daily for two or three days.

Mange should be treated with a mixture of sulphur and tāra mēra oil. The native owners know well how to apply this.

There is no difficulty in giving medicine to camels. They are made to kneel down, and anything put into their mouths is immediately swallowed.

In handling camels, and putting them into boats or railway carriages, the men who have been accustomed to them are far more skilful than Europeans. In working them also,

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any interference, except to prevent actual cruelty, usually does more harm than good. Always, if possible, allow the owners of the camels, or servants supplied by them, to accompany the animals. Get a sufficient number to admit of each camel having no more than a fair load, but do not offer advice to the natives in the actual loading. Leave them to do it in their own way.

LOADING CAMELS.

There is great art in putting on the load, as its security depends entirely upon balance. The pack-saddle, palān, is not girthed closely to the body, but has merely a slack rope going under the chest to prevent it falling off when the camel is loose.

It is *very important* to let each animal retain the saddle with which his owner has been accustomed to work him. A new saddle is very likely to gall until its want of exact adaptation to the back has been found out by actual trial under a load, and remedied. Of course, like horses, a thin camel is much more liable to be galled than one in good condition; and an animal out of work for a long time is more liable than one whose skin has been hardened by the rubbing of the saddle.

FEEDING CAMELS.

Camels keep in the best condition when plentifully supplied with the leaves and twigs of various trees and bushes.

When these are not obtainable, they can manage moderately well upon various kinds of grain and what is called missi busa, or chaff, made from stalks of vetches. They will rather starve for a long time than eat white busa, which is made by chopping or breaking wheat, barley, or rice straw into short pieces.

If allowed to stroll in a jungle, where food is plentiful, for several hours after each day's march is over, they will eat so much that no more food will be required until after the march on the following day.

It is said that 40,000 camels died during the late campaign

in Afghanistan. This mortality was chiefly attributable to the following causes :

1. Want of sufficient food.
2. Employment of camels reared in the southern parts of India, which were therefore unable to bear the cold of Afghanistan in the winter.
3. Employment of camels before they were full-grown.

Large numbers of animals were ruined by galls and sore backs, caused by ill-fitting saddles, or by being kept standing too long after being loaded. Injuries of this kind could rarely be properly treated, owing to want of a sufficient number of veterinary surgeons.

OXEN.

Oxen in India vary so much in size that it is difficult to lay down any rule as to the loads which they can draw.

Some are smaller than the very smallest Welsh mountain cattle, while others are larger and more powerful than Hereford oxen.

A veterinary surgeon who has had experience in cattle practice can, of course, treat their diseases more successfully than natives ; but the latter have nothing to learn from us about the best methods of feeding, working, and general management.

When journeying for any length of time upon stony roads, oxen require shoeing. They have to be cast before the shoes can be applied, and all this is better done by the native shoeing-smith than by the English.

The average oxen of India do not travel more than two miles an hour when drawing loaded carts. They are therefore not well suited for baggage purposes in an enemy's country, where it might be necessary for them to march with camels, mules, or elephants, all of which walk much faster.

PACK OXEN.

In parts of India where there are no made roads or tracks level enough for carts, oxen are used by natives as pack animals. There are certain castes called Brinjāri who make

their livelihood, to a great extent, by **carrying** salt and grain from one part of the country to another.

In districts where there are no **roads** suitable for carts, great use might be made of bullocks for pack purposes. If in mountains, it would be necessary to shoe them.

The pack-saddles used by the native carriers are fairly efficient—better certainly for bullocks than any of the saddles now used by Government for pack purposes.

MULES AND PONIES.

Mules and ponies, especially the former, are faster walkers than camels or oxen.

The most serviceable height for a pack mule is from thirteen to about fourteen hands. Under thirteen hands he has not sufficient muscular power to carry a heavy load; and if much over fourteen hands, it is difficult to lift a heavy load on him when packing.

When large numbers of mules are suddenly required in India, it is sometimes impossible to procure the majority of them over four years old; and, like horses, they are not full-grown until five. Provided they are not more than this, it is not of great consequence if they show signs of age in their teeth; for mules can work to a much greater age than horses.

Although Indian ponies are very hardy, mules are still more so, and they have the further advantage of being able to work well without shoes, even over rocky roads. For instance, they will carry loads for weeks at a time in the Himalayas, doing the usual daily marches of ten or twelve miles without showing the slightest tenderness in their feet. I believe, however, that for a long campaign over rocky ground shoeing might be advantageous. Americans say that they find shod mules carry loads with more ease than unshod.

Indian mules are usually very sound. They frequently have toes badly turned out, weak fetlocks, and similar deformities, caused chiefly by starvation, neglect, or by being worked at too early an age; but unsoundnesses—such as spavins, splints, sprains, or ringbones—are extremely rare.

SELECTING **MULES** AND PONIES FOR WORK.

In selecting mules or ponies for pack purposes, it is well to remember that the same formation is not desirable as in those required for riding. For instance, the back should be straight, or even convex, as that shape gives extra carrying power, and is less liable than a back hollowed, even gently, to be galled by the fore and rear ends of the pack-saddle. A thick, upright shoulder is better than an oblique one. The elephant, rhinoceros, and other very heavy animals have upright shoulders—a formation in which the scapula, humerus, and radius are placed at obtuse rather than at acute angles, giving them a mechanical advantage for supporting great weights.

POINTS OF MULES.

The most essential points to be attended to when buying pack-mules is to select them with short straight backs, broad chests, round barrels, deep back ribs, short legs, and black hoofs. The fetlocks should not be very oblique, and the hocks should stand well apart. When mules are very cow-hocked they are apt, if worked under heavy loads and half starved, as is frequently the case during campaigns, to knock one hock against the other in walking. Indian mules frequently are sickle-hocked, and have the toes of the fore-feet turned very much outwards. The latter defect makes them liable to 'brush' when in low condition, unless they have wide chests. In sickle hocks the tibia and metatarsal bones are working at a mechanical disadvantage. Of course, when buying large numbers it is impossible to procure them free from numerous imperfections, but the less they have of the above-mentioned defects the better will they work.

There are two other points which should be attended to—they should have good eyes, and should not have parrot-mouths, otherwise they will be unable to graze in places where herbage is short.

FEEDING MULES.

A good mule of thirteen to fourteen hands high, when properly fed, will carry a load of two maunds, or 160 pounds, on a long march, and considerably more if merely working for a few days.

Those of average size will work very hard upon two sirs, or about four pounds, of grain daily, provided they have plenty of chaff, which they often prefer to grass, at least in India.

When chaff is not procurable, they will thrive upon the stalks of vetches, maize, or millet. They will eat and digest any kind of grain, and with plenty of good grass will work without grain at all.

PACK SADDLES.

With regard to pack-saddles, I have never seen one belonging to Government which was not either very heavy or liable to gall, unless perpetual attention were paid to the stuffing.

I strongly advise anyone employing Indian mules for carrying his baggage, to use the native pack-saddle called sunkha, supplied by the owners of the animals. I have always done so when travelling about the Himalayas, and have never had a mule disabled by a sore back. The Guides, a large corps of both cavalry and infantry belonging to the Punjab Government, retained the native pack-saddle with all the baggage mules which they used during the late Afghan campaign. The colonel commanding told me that they found nothing superior to it, if so good, and that they had very few sore backs.

SUNKHA.

The sunkha has some defects, but it is light, and readily adapts itself to the shape when the animals fall out of condition. It is composed of a tube of strong canvas, or soft leather, about six inches in diameter, stuffed with long grass, and bent

into the shape of the staple of a padlock. The two legs of the staple are held a few inches apart and parallel, by means of strong broad tape or pieces of leather. They rest along the back with the spine in the space between them, the angle formed by the bent portion of the tube being in front of the withers. A folded blanket is used under the sunkha, to prevent it rubbing the skin. Boxes and other packages are carried by being placed in opposite ends of a broad sling, formed by sewing together the edges of a piece of canvas. The sling rests with its central portion across the sunkha, the packages being arranged so as to balance equally.

DONKEYS.

Donkeys, though not employed with armies, have been of great use in carrying food in India during the famines of the last few years. They are usually much smaller than English donkeys, but can carry great weights for their size, and are so tractable that a boy can drive fifteen or twenty of them without difficulty. They are very convenient for putting into ferry-boats when crossing rivers, as they are so light that when the boats are high in the sides the drivers frequently lift up their fore-feet over the gunwale and tilt them in.

I may here mention that some of the ferries in India are not provided with either piers or planks for enabling animals to walk easily into the boats. Many horses are extremely nervous, and difficult to force in, when attempts are made to do so by pulling at their bridles, and whipping them; but if one fore-leg be gently lifted over the gunwale, they will almost invariably leap in without further trouble.

Natives are often very awkward in putting horses into boats, and ought to be under European direction when doing so, but they are decidedly better than Europeans in both loading and unloading boats with bullocks or camels.

ELEPHANTS.

The elephants used with troops are the property of the Government, and they are supplied by the commissariat at a fixed rate—about ninety rupees monthly for each animal. They are faster walkers than camels, and can go over any kind of ground, climbing readily up and down steep places where a man can follow with difficulty.

One elephant can carry with ease two of the ordinary tents used by officers in India, one tent being a load for a powerful camel, and even too heavy for him when wet with rain.

The most common maladies to which elephants are liable are fistulous wounds caused by galls, fistula in the feet, cracks in the skin of the legs just above the soles, ophthalmia, a disease characterized by dropsical swellings under the abdomen and chest, and a form of debility in which the symptoms are great emaciation and sores on the skin.

Both these last diseases are called *zerbād* by the natives ; but as that name only means an evil poison, it gives no clue to the nature of the sickness. They are probably caused by want of sufficient wholesome food, and by exposure to the sun ; for the best treatment is said to consist in feeding well, sheltering them in sheds, and giving regular exercise. Tonic medicine should also be given, such as sulphate of iron, one and a half ounces ; *chiretta*, three ounces ; ginger, three ounces—mixed with boiled rice and the coarse native sugar called *gūr*.

Ophthalmia may be produced by exposure to the glare of the sun, and is said by Captain Forsyth to be also caused by feeding upon too great a quantity of the leaves of the pipal, or sacred fig-tree, during the hot season, although they are innocuous in the cold weather.

Of course the same treatment is necessary as in other animals, such as warm fomentations, sedative lotions, and protection from flies and light. Should a purgative be required, give one ounce of croton-seed, and six to eight drachms of aloes, made into balls with rice-flour and *gūr*.

Elephants are sometimes greatly troubled with worms, and

are stated to cure themselves by eating large quantities of earth. This causes purgation, probably from the irritation of sand, and expels the worms.

Should the earth fail to do this, the following medicine, which acts as a purgative, should be given :

Common salt and pulp of tamarinds, of each, from three and a half to four pounds, mixed with a large quantity of boiled rice. The Hindustani name for tamarind is imli.

Elephants cannot be forced to take medicines, but can readily be persuaded to do so by the native attendants called mahouts.

They are liable to a kind of insanity, called 'mast,' which is stated to be produced by sexual excitement, and which lasts for three or four months. The disease may be recognised in its earliest stages by a discharge like pus from the orifices in the skin behind the eyes. When that is seen, the animal should be securely chained, or he will be very likely to kill some one.

THE END.

